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THE MAMMALS OF THE NORTHERN SLOPES OF MT. KENYA

By

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INTRODUCTION

Following the construction of the Wilson (Timau) track in 1965, members of the Department of Zoology, University College, Nairobi, planned a short field expedition to study this relatively unexplored region of Mount Kenya. The party was on the mountain from March 17 to 27 1966. A base camp was established at 12500 ft (3800 m) in the Kazita West Valley, and field investigations were carried out along the whole length of the track from 11000 ft (3350 m) to its termination at 13800 ft (4200 m).

Each member of the expedition carried out his own programme of research as follows: Drs. M. J. Coe (leader): microclimates, birds and small mammals; J. B. Foster: small mammals; R. Harmsen: insects; J. B. Sale: hyrax; Miss J. Angwin: birds; Miss I. Jabbal: insects; and Mr. A. Hanid: vegetation. Mr. Kisoi joined the expedition as a general field assistant, and Drs. A. D. Q. Agnew and H. F. Rowell each spent a few days with the party working on vegetation and grasshoppers respectively.

It is intended that all aspects of this expedition will be published in this Journal; the present paper deals with mammalian aspects of the investigations.

Previous Mammal studies on Mount Kenya

In 1885, Count Samuel Teleki led an expedition through the western forests of Mount Kenya to become the first European to see and describe the general features of the alpine zone. They climbed the eastern wall of the Teleki Valley to an altitude of about 15000 ft (4570 m). In Von Hohnel's account of the expedition he reported the presence of a "marmot like" mammal living in large numbers among the rocks. This is the first written reference to the Mount Kenya hyrax (*Procavia johnstoni mackinderi* Thomas).

J. W. Gregory, the British geologist, visited the mountain in 1893 and published (1921) the first evidence that the area had been heavily glaciated down to an altitude of about 9500 ft (2900 m). He also recognised the strong northern boreal affinities of the alpine flora.

The first ascent of the peaks was made by Sir Halford Mackinder, in 1899, who brought back to Europe with him many skins of mammals and birds. Thomas described the Mount Kenya hyrax in Mackinder's honour in 1900.

It was not until 1909—1912 that Mearns and Loring made extensive collections above Meru, while over the same period Loring obtained specimens from the south-

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western aspect. It was from their collections that we owe our most complete knowledge of the mountain's mammal fauna (Roosevelt 1910, Hollister 1919–1924).

Moreau (1944) compiled the first list of Mount Kenya vertebrates and this remains the only attempt to delimit the altitude ranges and ecology of the birds and mammals of the area.

During the study of the ecology of the alpine zone of Mount Kenya Coe (1967) carried out preliminary observations on habitat separation of mammals and birds in the alpine zone.

THE AFRO-ALPINE HABITAT

Mount Kenya rises from semi-arid lowlands to an altitude of 17055 ft (5198 m) above sea level and, in so doing, exhibits a marked zonation of climate and vegetation. The ecology of the vegetation of Mount Kenya has been described in detail by Hedberg (1964) and Coe (1964, 1967).

It is a characteristic feature of Mount Kenya's montane forest that it is almost entirely absent on the northern slopes (Hedberg *op. cit.*). Until a track was constructed on this side of the mountain in 1965, very little was known of its biology.

The primary factor influencing habitats at high altitude in equatorial regions is the diurnal temperature regime. With increase in altitude, not only does the temperature fall about 3°F for every 1000 ft (300 m) but the range between day and night temperatures also increases. The almost complete lack of annual seasonal phenomena is substituted by an alternation of high day temperatures and low night temperatures. This factor has influenced the vegetation, which has developed insulating mechanisms by which it can avoid these extremes. The manner in which these mechanisms have been exploited by the fauna has been discussed by Coe (1969).

The climate of the northern slopes of Mount Kenya appears to be both drier and milder than other aspects of the mountain. The increase in mean temperature at equivalent altitude appears to be 2–3°C.

Temperatures recorded between 12500 ft (3800 m) and 14000 ft (4260 m) in the Kazita Valley in 1966 were as follows:

A. *Stream side, 12500 ft (3800 m), Kazita Valley*. Under *Euryops* bush.

Mean temperature	6.8°C
Mean maximum	14.4°C
Mean minimum	—0.6°C
Mean daily range	15.5°C

B. *Ridge top above stream course, Kazita Valley, 12530 ft (3818 m)*. Under Ericaceous bush.

Mean temperature	7.8°C
Mean maximum	17.7°C
Mean minimum	1.7°C
Mean daily range	19.5°C

C. *Ridge overlooking Kazita Valley, 14000 ft (4260 m)*. Shaded by *Senecio keniodendron* R. E. Fr. & Th. Fr. Jr.

Mean temperature	4.8°C
Mean maximum	9.8°C
Mean minimum	1.2°C
Mean daily range	11.7°C

Isohyet diagrams plotted from data collected by the Hydrology Department of the Kenya Government show that rainfall on the northern slopes seldom if ever exceeds 40 in (1010 mm) per annum, compared with figures of 90–150 in (2285—3810 mm) that have been recorded on the SE quadrant. Intermediate figures are recorded for the western aspect (Coe 1967).

The vegetation zones of Mount Kenya may be delimited as follows:

MONTANE FOREST

This zone varies in depth on different aspects of the mountain with a virtually complete gap in the north, except for small isolated patches in valley bottoms between 9000–9500 ft (2750–2900 m) and consists of stunted specimens of *Juniperus* and *Podocarpus*. Small groves of *Hagenia* occur in depressions up to 10000 ft (3050 m). The presence of *Faurea* up to 20 ft (6 m) in height at between 9500 and 10000 ft (2900—3050 m) is an unusual and characteristic feature of this side of the mountain. The only other situation on the East African mountains where Coe is familiar with similar stands of this Proteaceous tree is on the plateau of the Cherangani range in Western Kenya.

MOORLAND (ERICACEOUS) ZONE

The density and species comprising this zone vary considerably on different aspects of the mountain. *Erica, Phillippia* and *Cliffortia* make up the main Ericaceous components and occur on all quarters. Dense stands of *Protea* are only found on the damper but well drained parts of the mountain from NE to S, and appear to be entirely absent from the west. Other woody species occurring in the zone are *Adenocarpus*, *Anthospermum*, *Artemesia*, and *Euryops*.

Its altitude limits lie between 10750 and 11750 ft (3270–3580 m) and in sheltered valleys may reach an altitude of 13500 ft (4100 m).

On the northern slopes, this vegetation is intermingled with stands of *Hagenia* and *Faurea* at 9000 ft (2750 m) and may be distinguished as a distinct association as high as 12500 ft (3800 m).

ALPINE ZONE

This zone is characterised by extensive areas of *Festuca* tussock grassland in which are interspersed stands of *Lobelia* and *Senecio*. The area has been divided into an upper and lower alpine zone but this division since it is based largely on the distribution of *Senecio keniodendron* and *S. brassica* R.E.Fr. and Th. Fr. Jr. is of little help when considering the mammal fauna, as their altitude limits are very variable. The alpine zone can be considered to extend from the upper edge of the ericaceous zone (11500–12000 ft) (3500 m–3650 m) to the lower edge of the Nival zone at the foot of the peaks (15000 ft) (4570 m).

The vegetation of this zone on the mountain's northern face is best considered by reference to individual plant associations occurring on varying degrees of exposure, slope and soil type. These may be classified as follows:

(a) **Rocky ridge tops:** Usually much eroded and subject to considerable frost action. Up to 13000 ft (3960 m) low scattered ericaceous shrubs occur interspersed with tussocks of *Deschampsia flexuosa* (L.) Trin. The ground flora is poor due to frost heaving of the soil and the percentage of bare ground increase with altitude till at 14000 ft (4260 m) there is less than 50% ground cover.

(b) **Valley sides:** In this situation drainage is good and surface water available virtually throughout the year. Large solifluction terraces develop on steep ground, particularly where there is a shallow rocky substratum. The main floral components are large areas of *Festuca* tussock mixed with stands of *Senecio keniodendron* and *Lobelia telekii* Schweinf. A rich ground flora exists between the tussock bases and may include *Alchemilla*, *Bartsia*, *Blaeria*, *Swertia*, *Anagallis*, *Geranium* and *Helichrysum*. A small composite *Erigeron alpinus* L. is very common in this situation on the northern slopes between 11500 and 13000 ft (3500–3960 m). It does not occur on other aspects of Mount Kenya and this is the first record of its occurrence in East Africa. This species is known from the Ethiopean highlands and montane regions of central and southern Europe (Coe and Agnew. Unpublished field observations).

(c) **Waterlogged situations:** Most valley bottoms contain areas of impeded drainage, as do shallow glacial scour depressions in valley heads and on broad ridges. These areas

of boggy ground contain a very characteristic vegetational association that is a very important feature of the alpine zone. The flora consists of dense stands of the sedge, *Carex monostachya* A. Rich. with scattered and conspicuous stands of *Senecio brassica* and *Lobelia keniensis* R.E.Fr. and Th.Fr. Jr. The most common constituent of the ground. flora is *Alchemilla*, and a rich Bryophyte flora.

NIVAL ZONE

Limited to areas in which recent signs of glacial activity can be observed (Coe 1967). Its lower limit lies at 15000 ft. (4550 m).

The physiography of the northern slopes of Mount Kenya differs markedly from other aspects. The peaks on this side of the mountain show far less evidence of glaciation than the SW. and E. and, in consequence, there are fewer moraine deposits and the valleys are less deeply eroded. As a secondary factor, many of these valleys have been partially infilled by lavas and ashes from the secondary volcanic cone Ithanguni in the NE. This activity has accentuated the very gentle undulating landscape of this side of the mountain.

METHODS

(a) Trapping

Three types of trap were used to catch small mammals: break-back rat traps, Sherman live traps (measuring 3″×3″×12) (7.6×7.6×30.5 cm) and bucket traps measuring 6″ (15 cm) diameter at the top, (12.5 cm) at the bottom and 12″ (30.5 cm) high). The bucket trap was sunk in the ground so that the top was flush with the ground, and a few centimetres of water added to prevent the captives from jumping out. All traps except the buckets were baited with a mixture of peanut butter, rolled oats and sardines.

Cage-type traps were used to catch larger mammals such as Hyrax and Zorilla.

(b) Pellets

Pellets were collected from beneath rocky bluffs near base camp below a probable roost of Augur Buzzard (*Buteo rufofuscus augur* Rüppell) and west of Hook Tarn below the roost of a Mackinder's Owl (*Bubo capensis mackinderi* Sharpe). Their contents have since been analysed.

(c) Ear-tagging experiments

Attempts were made by Coe to ear-tag *Otomys orestes* Thomas and to follow their movements within their home range. The experiment was carried out between March 20th and 27th, 1967. An area 50 metres square was selected close to base camp. The ground bordered a stream in the foot of the valley and was covered by *Festuca* tussocks, *Alchemilla argyrophylla* Oliv. scrub and bare rock. Fifteen Sherman traps were baited with peanut butter and rolled oats and set along apparently-used *Otomys* runs within the area. The trapping quadrant was delimited by wooden pegs placed five metres apart and numbered 1–10 along one margin and A–J along the other. In this way, it was possible to record the position of traps and captures on a sketch map.

Animals trapped were tagged in their right ears with "Michel" surgical skin clips measuring 3 mm×18 mm before closure. Each rat was removed from the trap and the clip attached by means of artery forceps, close to the base of the pinna, without occluding the meatus. Animals were released immediately after tagging and the trap reset at the same spot.

RESULTS

(a) Trapping

Captures from all the types of trap used are shown in Table 1. The bucket traps proved about eight times more effective than rat traps, one mammal being caught every 3.4 trap nights in the buckets while the recovery rate from break-back rat traps was

only one animal every 26.7 trap/nights. This may be explained in part by the fact that the buckets are able to catch any size of small mammal, whereas the rat traps can only generally catch the larger species. The bucket traps could also catch more than one creature in a single night and insectivores seemed to be attracted to them. On the other hand, the data available suggests that *Lophuromys* actively avoided the bucket traps. Clearly, both types of trap must be used if one is to sample the whole spectrum of small rodents and insectivores.

TABLE 1

TRAPPING RESULTS

	Otomys	*Lophuromys*	*Rhabdomys*	*Graphiurus*	*Dendromus*	*Crocidura*	*Surdisorex*	*Total*	*% Trap Success*
Bucket Traps 166 Trap Nights	19	0	0	8	5	12	5	49	29%
Rat Traps 748 Trap Nights	19	6	2	1 (Tail only)	0	0	0	28	4%
Total	38	6	2	9	5	12	5	77	8%

On the night of 26th March, 20 bucket traps were set in two lines through an extensive area of *Carex monostachya* bog situated on slightly sloping ground at 13000 ft (3960 m) between the Kazita West Valley and the Liki Valley.

Areas of *Carex monostachya* and scattered stands of *Senecio brassica* and *Lobelia keniensis* form an important feeding area for rodents. In the situation under consideration, it is clear that the rodents live on raised, well-drained ground above the bog and use it only as a feeding area at night. On all sides, large numbers of tracks lead from patches of *Senecio keniodendron* "forest" to the bog margins. In spite of extensive searching during the day, there was very little evidence to suggest that many of these rodents were resident. The only possible exception to this statement is that of the dormouse, *Graphiurus* (*Claviglis*) *murinus* Desmarest, which occupies dense stands of *Senecio brassica.*

Trap series "A"

10 "buckets" were set at 2 metre intervals across part of the bog which had an even cover of *Carex* tussocks in which were dispersed large stands of *Senecio brassica* and *Lobelia keniensis.* Areas of black humic soil occurred between the tussocks. Due to heavy rain, the traps were not visited until the morning of the 28th March, but since all the traps were filled with rainwater on the night of 26th, it is assumed that all 13 animals caught were trapped on the first night.

The following species were caught:

Otomys	3
Lophuromys	3
Graphiurus	1
Surdisorex	1
Crocidura allex alpina	2
Heller	2

Crocidura f. fumosa Thomas	3
	—
	13
	—

The single specimen of *Graphiurus* was caught adjacent to a dense stand of *Senecio brassica* and the *Crocidura* between a large clump of *Carex* tussocks. The other specimens were caught in buckets set along used *Otomys* runs.

Trap series "B"

10 "bucket" traps were set in a very wet area of bog that was covered by dense stands of *Carex monostachya* and *Senecio brassica.* Intervening ground was virtually waterlogged. As with series A, all the traps were filled to the brim with rainwater on the night of 26th March. Seven animals were trapped.

Otomys	4
Lophuromys	1
Graphiurus	2
	—
	7

No shrews were trapped in this series, while both specimens of *Graphiurus* were trapped adjacent to a dense stand of *Senecio.*

In all, 40 trap nights were conducted and 20 animals recovered—a 50 per cent trap success. Since, however, it seems likely that most of these animals were caught in the traps on the first night, the real figure of success is probably nearer 100 per cent.

During trapping in this bog at 13000 ft (3960 m), the area was sampled to determine the percentage utilisation of the ground surface by small mammal tracks. The method used was similar to that used by Agnew (1966) for game animals in the Tsavo park, except that here there was only one track category. The bog was surrounded by well-drained ground from which a large number of runs radiated to the bog below. Once they entered the bog, although the whole area was criss-crossed with runs there was no suggestion that many creatures had permanent burrows within the bog. Innumerable shelters were found in tussocks and at the bases of Giant *Senecio* and *Lobelia.*

Many tussocks within the bog were chewed almost to the base, but those around the edge were virtually untouched. Both alpine duiker and steinbuck were seen in the bog.

Rodent tracks for the most part ran close to tussock bases or around dense areas of vegetation, and were in few cases found crossing areas of bare ground. Samples were taken through a number of different vegetation types and the number of tracks counted along the transect. The average width of these tracks was 9 cm and, in most cases, appeared—from the presence of dung on the surface—to have been made by *Otomys*, after which other rodents and shrews used them. One might consider this rodent to be the primary track pioneer in the alpine grassland. Maximum surface utilisation was recorded in an area of dense *Carex* tussocks (16.6%) while the lowest was found in dense *Alchemilla* scrub (2.6%). The average utilisation across the bog was 6.3%. Table 2 shows the results of five transects across the bog.

Table 2

Vegetation	*transect length*	*No. of tracks*	*% utilisation*
Senecio, Lobelia, Alchemilla	25m	12	4.3
Senecio, Lobelia, Alchemilla, Festuca	6m	2	3.0
Carex, Alchemilla, Lobelia	18m	25	16.6
Senecio, Alchemilla, Lobelia	25m	7	2.6
Senecio, Lobelia, Alchemilla, Festuca	25m	19	5.1
Total	99m	65	6.3

(average track width = 9cm)

(b) **Pellets (Table 3)**

A total of 34 pellets was collected from an Augur Buzzard (*Buteo rufofuscus augur*) roost on a small cliff about one mile north-west of base camp. They contained the remains of 47 *Otomys orestes*, 4 *Tachyoryctes rex* Heller and 22 Carabid beetles (*Carabomorphus catenatus* Basil).

365 pellets were collected below a long cliff to the west of Hook Tarn and, since a Mackinder's Owl nest was found above this point on the cliff, it is assumed that the pellets were produced by this bird. The pellets were found to contain parts of 369 *Otomys orestes*, 12 *Tachyoryctes rex* Heller, 1 *Lophuromys flavopunctatus* Thomas, 1 *Rhabdomys pumilio* Thomas, 8 *Surdisorex polulus* Hollister, 6 *Crocidura spp*, 2 *Procavia johnstoni mackinderi* Thomas, 1 Microchiropteran, and 12 Carabid beetles (*Carabomorphus catenatus*).

Both birds of prey caught *Tachyoryctes*, indicating that rats are probably active close to the surface both by day and by night. The comparatively large numbers of the mole shrew *Surdisorex* caught by the owl and in bucket traps is interesting as this species is generally considered to be subterranean and quite rare. The closeness, however, of the two sets of data suggests that the larger collection may have contained pellets of both bird species.

Table 3

Contents of Augur Buzzard and Mackinder's Owl pellets from the Kazita Valley
(Carabid beetles not included)

Prey Species	*Augur Buzzard (34)*	*Mackinder's Owl (365)*
Otomys	47 (92%)	369 (92.5%)
Lophuromys	0	1
Rhabdomys	0	1
Tachyoryctes	4 (8%)	12 (3%)
Procavia	0	2
Crocidura	0	6 (1.5%)
Surdisorex	0	8 (2%)

(c) **Movement of** *Otomys orestes*

Only three *Otomys* were tagged in the study area during this period and all were recovered at other points in the grid. Specimen 2 was marked on 20th March and recovered subsequently on 26th and 27th March. The distance between the points of recapture was about 70 metres. Specimen 3 was marked on 22nd March and was killed in a break-back trap, 22 metres outside the study area on 24th March.

Results indicate that *Otomys* must range over distances of at least 100 metres from their more permanent shelters. The method of tagging with surgical skin clips would seem to be suitable for rodents such as *Otomys* which have large pinnae.

ANNOTATED LIST OF SPECIES

This list only includes those species actually seen or trapped by us on the northern slopes of the mountain and does not include those species known or thought to occur above the forest. For details of other species, reference should be made to Moreau (1944).

In compiling this list, we have followed Swynnerton and Hayman (1951) and Ellerman, Morrison-Scott and Hayman (1953). Until the Smithsonian Identification Manual of African Mammals has dealt with the shrews, the names of all *Crocidura* spp. must remain tentative. Child (1965) has pointed out the difficulties in dealing with these small mammals on Mt. Kilimanjaro.

ORDER INSECTIVORA

Family Soricidae

Crocidura allex alpina Heller — Pygmy Shrew

Occurs throughout the alpine zone up to 13500 ft (4100 m). Trapped on the northern slopes in tussock grassland in bucket traps set along *Otomys* tracks.

C. fumosa fumosa Thomas — Dusky Shrew

Not common in the alpine zone, but a single specimen apparently belonging to this species was trapped at 12500 ft, (3800 m) in *Carex-Lobelia keniensis* bog. It is much commoner in collections from lower altitudes and a series from the intermediate level is badly needed. From a frequency point of view, it does not appear to be particularly important in the ecology of the alpine zone.

C. turba zaodon Osgood.

The presence of this shrew in the alpine zone needs confirmation. It has been recorded in the Aberdares at an altitude of 11000 ft (3350 m) (Moreau 1944). Some of our specimens, slightly more robust than *C. allex alpina*, may be referable to this form.

Surdisorex polulus Hollister. — Mole Shrew

This small creature is, in many ways, the most interesting mammal on Mount Kenya. *S. polulus* is endemic on Mount Kenya with only one other species in the genus being known from the Aberdares to the west (*S. norae*). It has previously been recorded from altitudes of from 9000–12100 ft (2750–3680 m) (Moreau *op. cit.*). The present collections now raise its limits to at least 13000 ft (3960 m). Williams (1968) states that the mole shrew produces shallow burrows in areas where moss is abundant. All our collections were made on damp ground close to dense stands of *Senecio brassica*, sedge, and grass tussocks. Its forefeet, although fairly robust with long claws, do not give the impression that this is a truly fossorial animal. When more is known of its habits, we believe that it will be found to be a shallow-burrowing animal in humus and litter. Tipulid larvae and earthworms were found in the stomach of a Mount Kenya specimen, suggesting that its food habits are very close to the Golden Mole of the Ruwenzori range, Elgon. Recently Duncan and Wrangham (1969 pers. comm.) carried out a more-detailed study of the Golden Mole and the Mole Shrew.

ORDER RODENTIA

Super Family Muroidea

Family Gliridae

Graphiurus (Claviglis) murinus raptor Dollman — Dormouse

There is still a divergence of opinion over which sub-species occurs on Mount Kenya. Allen and Loveridge (1933) suggested that *G. murinus* should be considered as a sub-species of *G. soleatus* Thomas Wroughton, the Ruwenzori or western form. Since however *G. murinus* is recorded on Kilimanjaro (Child 1965) it seems probable that we are dealing with a western and an eastern form that may be separated at a specific or subspecific level.

This animal has not previously been recorded above the moorland, but specimens were found, on this occasion, to be common on the northern slopes of the mountain up to 13500 ft (4100 m). In almost all cases, the animals were trapped in association with dense stands of *Senecio brassica* in which we suspect it lives, or shelters.

Family Muridae

Sub-family Murinae

Rhabdomys pumilio diminutus Thomas Four Striped Grass Mouse

R. pumilio is widely distributed in Africa and the sub-species *diminutus* is recorded from the Aberdares, Mount Kenya and Kilimanjaro. The highest specimen on the northern slopes was taken to 12500 ft (3800 m). Compared with other alpine rodents, this animal is not common.

Lophuromys flavopunctatus Thomas Harsh-furred mouse

Widespread, having been recorded from the East African lowlands and up to an altitude of 11000 ft (3350 m) on the Shira Plateau of Kilimanjaro (Swynnerton and Hayman 1951) and 13500 ft (4100 m) on Mount Kenya. In alpine habitats, this rodent is common and its success may be due in large part to its coexistence with the herbivorous and abundant *Otomys*. Hanney (1964) reported that *L. flavopunctatus* in Nyasaland fed largely on insects and other animal material, grain and other vegetable material only being found in 3% and 5% respectively of the stomach examined.

Sub-family Dendromurinae

Dendromus insignis percivali Heller Striped Tree Mouse

Largely occupying *Otomys* runs in alpine grassland from 7500–14200 ft (2290–4330 m) (Moreau 1944). On all aspects of Mount Kenya, this small rodent can be caught throughout the alpine zone. There is no indication that it is a particularly arboreal creature in these situations, although animals caught close to stands of *Senecio kenioaendron* may indicate that they occupy the leaf frills of the Giant Groundsels. Collected on the northern slopes at 11000 and 13500 ft (3350–4100 m).

Sub-family Otomyinae

Otomys orestes orestes Thomas Groove-toothed Rat

Otomys tropicalis tropicalis Thomas Groove-toothed Rat

Both these species have been recorded throughout the lower levels of the moorland zone of Mount Kenya and, in these situations, it is difficult to separate them on an altitudinal or ecological basis. Our collections from the northern slopes are all *Otomys orestes* and one wonders if, since these species are very alike, earlier collections have in some cases been misidentified. They occur in large numbers in tussock grassland and, in some situations (especially damp areas around the lakes and tarns), the ground is honeycombed with their shallow burrows. Occasionally, areas are found that appear to have supported large numbers of animals but which seem to have disappeared. Whether or not these observations should suggest that these animals are subject to large population fluctuations is unknown at the present time. Certainly, with predation at such a low level and food present at a fairly constant level some form of regulation exerted within the population itself would seem to be a necessity (Coe 1967).

Throughout the grassland, these animals make very distinct runs which are used extensively by other species of rodent and insectivore. Although primarily burrowers, they construct small shelters (of a temporary nature) in tussocks, *Lobelia* and *Senecio* rosettes. Their more permanent holes are constructed at the foot of tussocks and at the bases of soil banks and ash deposits.

Otomys has been recorded from the forest to the foot of the peaks at 15000 ft (4570 m). Hollister (1919) records specimens of *O. orestes* collected at 10700 ft (3260 m), 13500 ft (4100 m) and 13700 ft (4175 m) on the western slopes and *O. tropicalis* from 7500–13700 ft (2280–4175 m). Moreau (1944) recorded the range of *O. orestes* up to 15000 ft (4570 m), which was confirmed by Coe (1967).

Subfamily Tachyorycinae

Tachyoryctes rex Heller. Mt. Kenya Mole Rat.

Limited to areas where the soil is light and suitable for excavation. Mounds found up to an altitude of 13500 feet (41000 m) on the northern slopes but, on other quarters, never seen above 12500 ft (3800 m). Mounds found in the forest are assumed to be of the same species, but—as so few specimens have been caught in these situations—it is difficult to be certain. It is possible that *T. spalacinus* Thomas recorded from the Njombeni range may also occur on the NE slopes of the mountain, or be conspecific. Meester (1968 pers. comm.) informs me that the Smithsonian Identification Manual for African Mammals will favour a single species for all the East African forms (i.e. *T. splendens* Rüppell).

Valley bottoms with thick black humic alpine soils are often covered with symmetrical mounds which, when viewed from valley walls, appear dark green. These mounds are up to six metres in

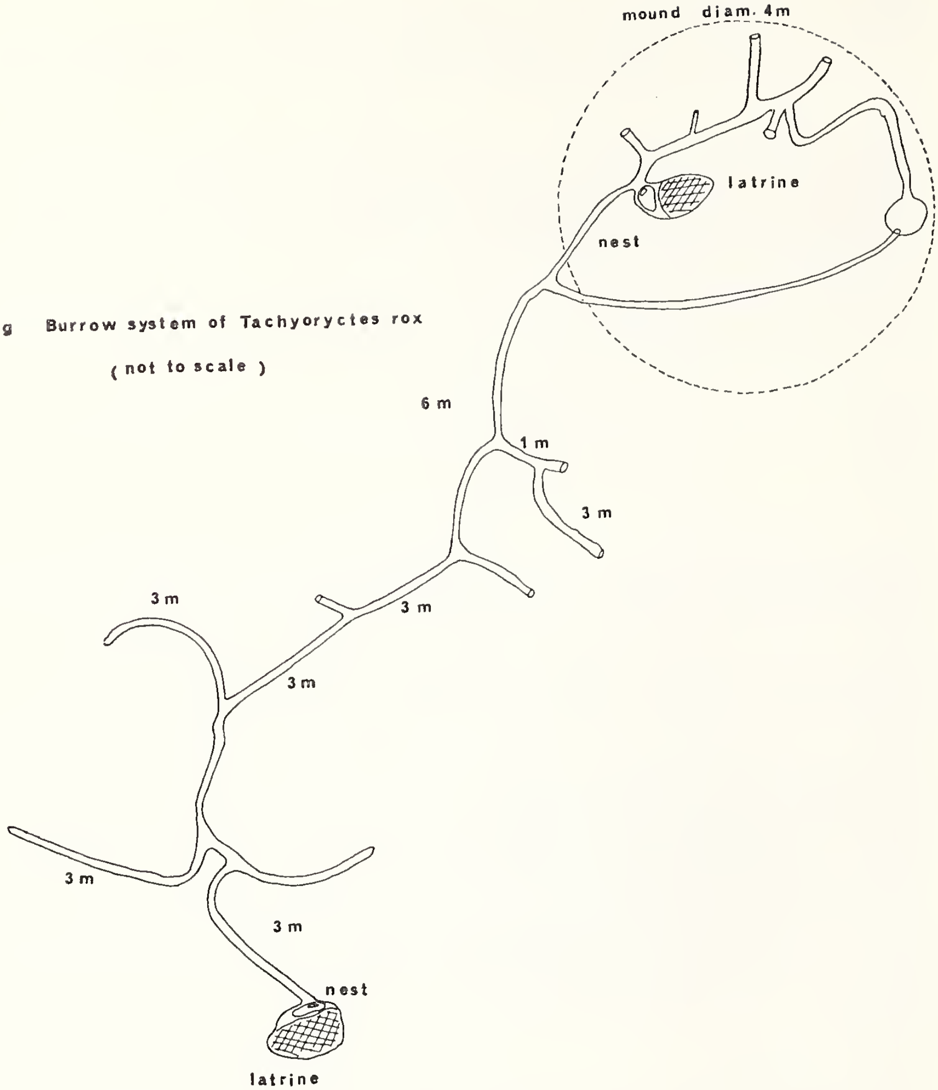

Fig Burrow system of Tachyoryctes rox

(not to scale)

diameter. Small groups of these structures have been described as tumuli, or earthworks, by local people. On close examination, it was found that the dark green colour was due to almost pure stands of *Alchemilla argyrophylla* that had colonised these raised patches of well-drained soil. The soil was very fine and virtually stoneless.

Excavations of several of these mounds showed that they were the result of long occupation and excavation by *Tachyoryctes rex*. Most of the mounds have been secondarily occupied by *Otomys*, which have burrows around the outer edges particularly where the sides of the mound have collapsed to produce a low vertical surface.

Close to the centre of the mound, at a depth of 45 cm, a large chamber was located, which contained, on one side, a nest constructed of grass stems, while the main nest of the cavity was used as a repository for dung, urine and chewed vegetable matter. The heat produced by this fermenting mass was considerable and measured 12°C, in contrast to the usual soil temperature at 12500 ft (3800 m) of 5–7°C. Large numbers of dipterous larvae occupied this mass and a number of emerging adults were caught, but are as yet unidentified.

Three other chambers of similar construction were excavated and it seems likely that the secondary function of these dung piles may be to maintain a relatively high temperature for the nests (Fig. 1).

The burrow system was followed to a depth of one metre and side tunnels were followed for distances of up to 12 metres from the main mound. Although activity could be seen at the entrance to a number of the excavated burrows, we were unable to catch a single specimen.

ORDER CARNIVORA

Subfamily Mustelidae

Ictonyx striatus albescens Heller   Zorilla

Recorded from arid lowland to montane forest habitats, but to date only a single specimen has been recorded in the alpine zone. This animal was trapped by J. B. Sale at 13800 ft (4200 m) at the head of the Wilson Track on this expedition. A large number of *Otomys* burrows and shelters had been excavated by a long-clawed predator at this altitude and we suspect that the animal trapped was responsible. No further specimens were caught, nor were there any signs of their droppings. Since this animal is fairly conspicuous at night and readily enters live traps baited with meat, the capture of a single specimen seems to indicate that the Zorilla is not an important predator at high altitude.

Family Felidae

Felis lybica Forster (Sub. sp. ?)   Wild Cat

Moreau (1944) does not record the Wild Cat as a constituent of the alpine mammal fauna. We observed several animals at night on the northern slopes, between 11000 and 12500 ft (3350–3800 m). A single animal was seen, on several nights, close to our camp in the Kazita Valley. Small heaps of dung, found at the foot of lava cliffs, we ascribe to this species. The rather badly-broken remains contained fragments of *Otomys* skulls. It has not been observed (MJC) on other quarters of the mountain and we must assume that it is another example of a mammal taking advantage of the northern forest gap to gain access to the alpine grasslands.

Felis pardus L.   Leopard

Present in all valleys on Mount Kenya, footprints have been seen (MJC) at 15500 ft (4700 m) in the Teleki Valley and at 14000 ft (4260 m) in the Kazita Valley in 1966. This mammal must be the important predator of duiker and steinbuck on the mountain. Hyrax remains have been found on several occasions in the lairs.

ORDER HYRACOIDEA

Procavia johnstoni mackinderi Thomas   Mt. Kenya Hyrax

Endemic to the alpine zone of Mount Kenya and restricted in altitude to levels between 11000 ft (3350 m) and the foot of the peaks. Animals on the northern slopes are found somethat lower than on other quarters. This restriction is in large part due to glacial activity, which was more active at altitudes in excess of 11000 ft (3350 m) in creating glacial debris that the hyrax could occupy. They also occur in boulder debris at the foot of lava cliffs. Their altitudinal limitation in this way effectively separates them from the Tree Hyrax (*Dendrohyrax arboreus crawshayi* Newman) which occupies an arboreal niche in the montane forest (Coe 1962).

The Rock Hyrax is not as common on the northern slopes as it is elsewhere on the mountain. In large part, this may be explained by the more undulating landscape of this quarter and by the comparative rarity of large cliffs and moraine deposits.

This hyrax feeds on a wide variety of herbs surrounding its burrows; but on the northern slopes, J. B. Sale (Pers. comm.) found that they were taking far more Giant Lobelia and *Senecio* than elsewhere on the mountain. Where colonies are close to valley bottoms, long straight tracks pass through the tussock grassland to water at which they drink, or where they graze on the lush swampy vegetation (Coe 1962, 1967; Sale 1965a).

Like all rock hyrax, they are social animals and the alarm calls of sentinel males can be heard at a considerable distance.

Although *Procavia* is a largely diurnal mammal, on moonlight nights on Mount Kenya they call throughout the night (Coe *op. cit;* Sale 1965b).

ORDER PERISSODACTYLA

Equus burchelli Gray Common Zebra

One or two herds of these animals appear to be resident on the northern slopes. Zebra dung is commonly seen at altitudes up to 14000 ft (4260 m). One herd was seen (in February 1966) on a col at the head of the Kazita Valley, at an altitude of about 14500 ft. (4400 m). The same herd was later seen at 10500 ft (3200 m) in the moorland zone, suggesting a wide-ranging habitat.

ORDER ARTIODACTYLA

Sylvicapra grimmia altivallis Heller Common Duiker

The highland sub-species of Common Duiker is present in all valleys on Mount Kenya, where it mainly occupies *Senecio keniodendron/Alchemilla argyrophylla* scrub along the valley walls. Although common on most aspects of the mountain this animal appears to be largely replaced by the steinbuck (see below) on the northern slopes. Where extensive boggy areas support stands of *Senecio brassica/Carex monostachya*, resting animals are often flushed at night. Since these areas are often forest hollows, their presence in these situations at night is surprising.

Raphicerus campestris Thunberg Steinbuck

Common in open grassland on the northern slopes from 8000 -14000 ft (2440–4260 m). Not recorded elsewhere on the mountain except for a dead specimen found on the shores of Teleki Tarn in January 1958 (MJC). It seems reasonable to suppose that the large number of animals seen on this quarter of the mountain are a resident population that, like the Zebra, gained access through the northern forest gap.

The Zoogeographical Affinities of the Mount Kenya mammal fauna

Any conclusions regarding the zoogeography of the afro-alpine mammal fauna must be in large part dependant on the state of the taxonomy of the group under consideration. There are, however, a number of forms that appear to be sufficiently distinct to allow comment.

Hedberg (1961) has examined endemism in the afro-alpine flora and has found that, apart from a number of important vicarous taxa that appear to have arisen on the African mountains, by far the largest part of the flora has been derived from a wide variety of sources in Southern Africa, Himalaya, the Mediterranean and Europe. The mammal fauna does not exhibit such a wide radius of origin, but shows relationships with South Africa, Ethiopia and West Africa, as well as a reasonably high proportion of endemic East African forms.

Considering the rigours of the climate, it is of interest to note the large number of insectivores occurring in these regions. The alpine zone of Mount Kenya alone claims three species of *Crocidura*, one species of *Suncus* and one species of *Surdisorex*.

Of the three species of *Crocidura*, *C. alex alpina* appears to be endemic to Mount Kenya, the type *C. a. alex* Osgood having been recorded at Naivasha in the Rift Valley. If Aberdare and the Kinangop are the highland connections between the populations, it seems likely that intermediates may be found when collecting is more complete. *C. fumosa fumosa* occurs up to 1300 ft (3960 m) and is synonymous with *C. alchemillae* Heller of the Aberdares. Other species are known from Kilimanjaro and Ruwenzori. With this distribution, there seems to be little reason why it should not also be found on the intermediate ranges of Elgon and Cherangani.

C. turba zaodon is a wide-ranging form occurring in the Kenya highlands, from Nairobi to the base of the alpine zone of Mount Kenya.

The small *Suncus infinitesimus* Heller has been collected from Rumuruti, northwest of the mountain and into the ericaceous moorland of Mount Kenya. The genus has a wide range, from South Africa through Tanzania to Ethiopia. It does not yet appear to have been recorded from the more westerly land masses.

Undoubtedly the most interesting of the Mount Kenya insectivores is the mole shrew *Surdisorex polulus*. This short, squat mammal has every appearance of the European

mole and its elongated digging claws on its front feet suggest that it may occupy a similar niche. The genus is endemic to Mount Kenya and the Aberdares, latter range carrying a distinct species *S. norae* Thomas. It is surprising to find an endemic mammal genus so apparently restricted in its range and it seems possible that it may be recorded elsewhere when collecting is more complete. It is indeed so local that it is possible that *Surdisorex* on the eastern mountains is filling the niche occupied by the Golden mole *Chlorotalpa* on Elgon and Ruwenzori.

The only genera of rodents that are ecologically important in the alpine zone and therefore of zoogeographical interest on Mount Kenya are *Otomys*, *Tachyoryctes*, *Dendromus*, *Lophuromys*, *Graphiurus* (*Claviglis*), *Rhabdomys*.

Otomys appears to be one of the commonest rodents on the East African mountains and is distributed from South Africa to the Ethiopian highlands, while a single species *O. burtoni* Thomas is found on Mount Cameroon. East Africa seems to have been the speciation centre for this genus with 12 species and innumerable subspecies, some of doubtful status. *O.j. jacksoni* Thomas of Elgon is closely related to *O.j. malkensis* Frick of Ethiopia, which suggests an interesting zoogeographical link. The alpine zone of Mount Kenya is occupied by *O.t. tropicalis* and *O.o. orestes*, but the present state of our knowledge makes it difficult to decide whether both species occur together, are divided on an altitudinal basis, or are conspecific. The most widely-spread of the East African montane species is *O. tropicalis*, with subspecies having been attributed to Mt. Kenya, Njombeni, Nyiru, Elgon and Virunga. The association of the first four localities may suggest the route by which species have emigrated from the Ethiopian highlands, having progressed either east of Lake Rudolf via Mts. Nyiru and Kulal, or west of Rudolf via the intermediate peaks, such as Moroto and the Imatongs in the Sudan.

Dendromus shows a fairly continuous distribution from South West Africa to Ethiopia and the Congo. Numerous species have been described, many of which appear to be isolated in highland regions throughout its range. *D. insignis percivali* is known from the Mathews range, in the arid Northern Province of Kenya, and from Mount Kenya. Further collecting may well show that the two forms are distinct. Should this not be so, then one might suspect that many of the other apparently-isolated subspecies in this genus are, in fact, synonymous. This species is widespread throughout East Africa, the Congo to Ethiopia.

Tachyoryctes is a specialised burrowing rodent which, like so many other strictly fossorial creatures, is limited by the distribution of soils of suitable texture for excavation. There appears to have been considerable speciation within the genus in Afroalpine habitats. Mount Kenya has the large *T. rex* and the nearby Aberdares, *T. audax* Thomas. Other species are known from Kilimanjaro (*T. daemon* Thomas), Elgon (*T. ruddi* Thomas) and Muhuvura (*T. ruandae* Lonn. & Gyld.). *T. spalacinus* has been described from an altitude of 5400 ft (1640 m) in Meru District on the NE. slope of Mt. Kenya. It will be interesting in the future to see if *T. rex* and *T. spalacinus* are separated altitudinally on the northern slopes of the mountain. *Tachyoryctes* is a largely East African genus, being recorded from Somalia, Ethiopia, Kenya, Uganda, Tanzania and the Eastern Congo.

The genus *Lophuromys* is common on all the East African mountains and, in addition, is very widespread from Sierra Leone through Ghana to the Cameroons, the Congo, East and Central Africa and Ethiopia. The fact that this harsh-furred rat has adopted a largely insectivorous diet may account for its success and wide range. *L. flavopunctatus* occurs on Kilimanjaro, Mt. Kenya, the Aberdares, Elgon, the Mathews range and the Ethiopian highlands, once again suggesting another possible affinity with the latter. The Ruwenzori and Kigezi mountains have their own species *L. woosnami* Thomas. Ellerman (1941) suggests that *L. flavopunctatus* falls into a group with *L. sikapusi* Temminck, a lowland rain forest form with a range from the west coast to Kenya, while *L. woosnami* forms a separate group with *L. prittei* Thomas of south west Kigezi, Uganda. Missonne (1968) has reduced the number of species in this genus to five, the two most common being *L. sikapusi*, the western lowland form, and *L. flavopunctatus*, the eastern

highland form. The other three species recognised are all rare or uncommon endemic species from highland areas of the south-eastern Congo. One suspects that, since Ruwenzori and the other western mountains are surrounded by rain forest, it is very likely that the western montane species have been derived from the lowland form.

The Four-Striped Grass Mouse *Rhabdomys* is essentially a lowland animal, with a range through eastern Africa, from the Cape to Kenya, and only one valid species. *Rhabdomys pumilio diminutus* of Mount Kenya has a wide range, from Naivasha to the top of the Aberdares, at least 12500 ft (3800 m) on Mount Kenya, and the moorland of Kilimanjaro.

The dormouse *Graphiurus* (*Claviglis*) is widely distributed over the whole of Africa south of the Sahara. From this point of view, it is difficult to postulate zoogeographical relationships. We can state, however, that subspecies of *G. murinus* have been described from the Cape to Kenya, and that those recorded from Kenya are montane and known from the Mathews range, Taita, Mt. Kenya and Elgon. *G. soleatus* occurs on Ruwenzori, with an apparent gap between this population and another on the Ukinga mountains, on the northern end of Lake Nyasa.

The last group of mammals worthy of consideration from a zoogeographical point of view is the Hyracoidea. Although the genus *Procavia* and subgenera *Heterohyrax* and *Dendrohyrax* are distinct, all three forms have entered and occupied a montane, rocky habitat in East Africa. On Mount Kenya, *Procavia johnstoni mackinderi* has occupied a rocky habitat in the alpine zone over 12000 ft (3650 m), having probably gained access through the northern forest gap (Coe 1962). On Mount Elgon, *Procavia habessinica daemon* Thomas and *Heterohyrax syriacus kempi* Thomas have both occupied the alpine zone with similar success.

The most interesting case is that of Ruwenzori, where a continuous forest zone has prevented colonisation of the alpine boulder habitat by *Procavia* or *Heterohyrax*. Instead it has been occupied by a tree hyrax which has progressed from the montane forest proper through the dense Erica forest to altitudes well in excess of 13000 ft (3950 m). This hyrax is *Dendrohyrax arboreus ruwenzori* Neumann. Though most tree hyrax in East Africa are quite small, this animal is as large as the Mount Kenya *Procavia* and bears very long, extremely dense fur—a typical adaptation to this inclement environment.

In summarising, we may say that the montane mammal fauna of East Africa bears elements that have apparently been derived from West Africa, South Africa and the Ethiopian Highlands. The latter connection is of particular interest, for Moreau (1963), studying the montane avifauna, and Carcasson (1964), considering the zoogeography of African butterflies, are unanimous in finding little suggestion of a montane connection between the Highlands of Ethiopia and East Africa.

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SUMMARY

1. This paper presents the results of mammalian investigations conducted on the northern slopes of Mount Kenya in March 1966.
2. Previous mammal studies on Mount Kenya are briefly outlined.

3. The climate, physiography and vegetational associations of the northern slopes are described. In particular it is pointed out that the climate of this aspect of the mountain appears to be both milder and drier than elsewhere and, in consequence, its vegetation shows marked differences.

4. Mammals were trapped using "break-back" and "live" traps, of varying size, and "buckets". Pellets of Augur Buzzard and the Mackinder's Owl were collected. Preliminary experiments were carried out by ear-tagging *Otomys* rats with numbered surgical skin clips.

5. The results of trapping small mammals show that there is an unusual concentration of small mammals in *Carex monostachya* bog. "Buckets" were far more effective in trapping insectivores than were other traps.

6. Examination of pellets attributed to Augur Buzzard and Mackinder's Owl indicate that two of the small mammals are active both during the day and at night.

7. *Otomys* rats were shown to travel distances of up to 50 metres from their place of first capture.

8. All small mammals trapped or observed on the northern slopes are enumerated, together with brief notes on their altitudinal distribution.

9. The zoogeographical affinities of the alpine small mammal fauna are discussed. It appears that these creatures have been derived from the Western African, South African and Ethiopian regions, with a small but significant endemic element.

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APPENDIX

Numerical data of specimens trapped

Symbols on tables

No.	=	Number
Alt.	=	Altitude
S	=	Sex
TL	=	Total length
T	=	Tail length
HF	=	Hind foot
E	=	Ear (where given)
Wt.	=	Weight
ZW	=	Zygomatic width (where given)
CBL	=	Condylabasal length
SW	=	Squamosal width (where given)

Surdisorex polulus Hollister

No.	*Alt.*	*S*	*TL*	*T*	*HF*	*Wt.*	*CBL*	*SW*
72	12900 ft. (3920 m)	♀	133	50	15	10	24.9	13.1
29	12500 ft (3800 m)	♀	125	32	15	25	25.0	12.3
30	12500 ft (3800 m)	♀	120	37	15	20	24.6	13.2
34	12500 ft (3800) m	♀	120	35	15	20	23.8	12.6
41	12500 ft (3800 m)	♂	122	21	17	25	24.9	12.7

Crocidura fumosa fumosa Thomas

73	12900 ft (3920 m)		130	30	15		21.3	10.3

Crocidura turba zaodon Osgood

51	13500 ft (4100 m)	♀	106	45	12		17.0	7.9
46	12500 ft (4100 m)	♀	100	42	12		17.0	7.9
42	12500 ft (3800 m)	♂	110	40	13		17.0	7.7
45	12500 ft (3800 m)	♂	110	45	12		17.7	7.8
74	12900 ft (3920 m)	♂	107	44	11		17.2	8.1
24	12500 ft (3800 m)	♂	104	45	10		17.6	7.9
23	12500 ft (3800 m)	♂	100	42	10		17.4	7.8

Crocidura allex alpina Heller

75	12900 ft (3920 m)	♀	98	38	11		16.4	7.4
3	12500 ft (3800 m)	♀	96	45	6		17.4	7.9
27	12500 ft (3800 m)	♀	96	44	12		17.1	7.7
25	12500 ft (3800 m)	♂	98	45	11		17.6	7.9
17	12500 ft (3800 m)	♂	92	44	12		17.4	7.8

Dendromus insignis percivali Heller

No.	*Alt.*	*S*	*TL*	*T*	*HF*	*E*	*Wt.*	*ZW*	*CBL*
43	13500 (4100 m)	♀	171	94	23	14	10	11.7	12.3
53	13500 ft (4100 m)	♂	180	86	19	15	20	12.1	22.4
53	11000 ft (3350 m)	♂	180	95	20	15	15		
44	13500 ft (4100 m)	♂	174	94	20	15	15	12.0	22.4

Rhabdomys pumilio diminutus Thomas

37	12500 ft (3800 m)	♂	185	90	25	15	35	13.5	25.2

Graphiurus murinus raptor Dollman

9	12500 ft (3800 m)	♀	160	60	10		20	15.0	24.6
52	13500 ft (4100 m)	♀	160	75	16		25	14.8	24.8
78	12900 ft (3920 m)	♀	152	65	16		20	14.4	23.2
27	13500 ft (4100 m)	♀	140	70	14			14.3	24.1
76	12900 ft (3920 m)	♂	170	75	17		25	15.6	25.4
77	12900 ft (3920 m)	♂	169	70	19		25	16.3	25.9
26	12500 ft	♂	160	68	15		25	14.6	24.4

	(3800 m)								
35	12500 ft (3800 m)	♂	160	60	15		35	14.9	24.4
5	12500 ft (3800 m)	♂	155	60	10		30	16.0	25.2
19	12500 ft (3800 m)	♂	150	55	17		25	15.1	25.2

Otomys orestes orestes Thomas

No.	*Alt.*	*S*	*TL*	*T*	*HF*	*E*	*Wt.*	*ZW*	*CBL*
84	12900 ft (3920 m)	♀	245	80	30	20	140	18.7	35.0
22	12500 ft (3800 m)	♀	221	65	29	20	120	19.3	34.8
38	12500 ft (3800 m)	♀	212	62	29	20	75		20.0
39	12500 ft (3800 m)	♀	201	71	26	22	95	18.9	34.0
58	12500 ft (3800 m)	♀	185	20*	30	22	120	20.0	37.8
68	12900 ft (3920 m)	♂	275	97	30	25	205	20.8	40.4
12	12500 ft (3800 m)	♂	271	80	33	23	155	20.8	40.0
86	12900 ft (3920 m)	♂	261	84	32	25	160	19.3	37.7
69	12900 ft (3920 m)	♂	245	94	26	25	150	20.3	37.3
33	12500 ft (3800 m)	♂	210	61	27	21	110	19.5	36.7

Lophoromys flavopunctatus Thomas

79	12900 ft (3920 m)	♀	176	60	20		40	14.8	27.5
7	12500 ft (3800 m)	♀	172	55	24		55	14.8	28.8
59	12500 ft (3800 m)	♀	165	58	20		55	15.6	28.7
63	12500 ft (3800 m)	♀	161	57	22		60		
62	12500 ft (3800 m)	♀	162	48	23		55	15.7	29.4
57	12500 ft (3800 m)	♂	172	60	23		50	15.2	28.5
69	12500 ft (3800 m)	♂	171	60	21		60	14.3	27.8
81	12500 ft (3800 m)	♂	163	65	20		55	15.0	29.3
14	12500 ft (3800 m)	♂	152	36	23		60	15.0	29.3
65	12500 ft (3800 m)	♂	150	55	20		35	13.8	25.2
6	12500 ft (3800 m)	♂	146	37	23		55	15.3	29.4
80	12900 ft (3920 m)	—	166	60	20		40	14.4	27.3

END

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BIRDS OF THE ARUSHA NATIONAL PARK, TANZANIA

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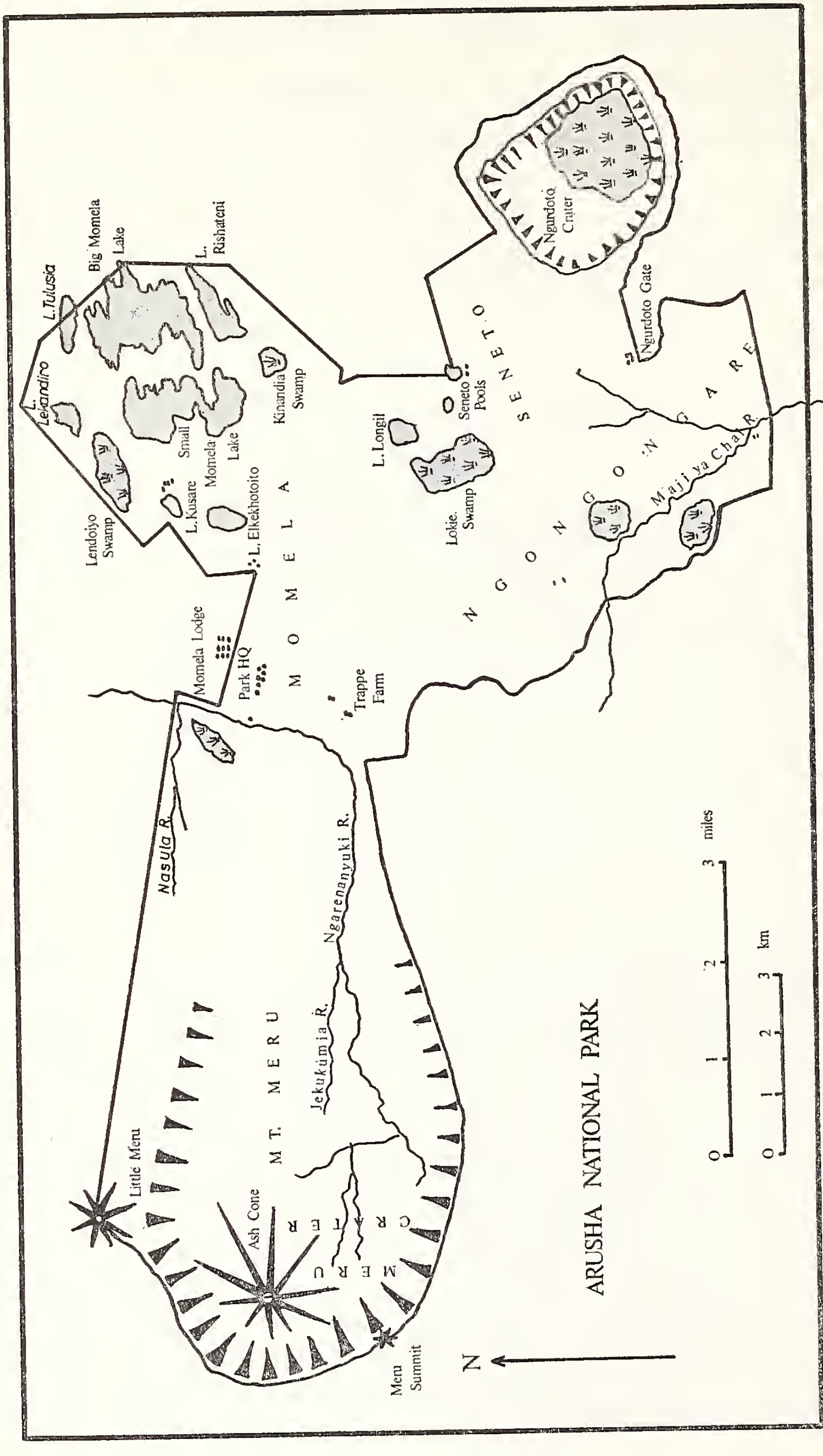
INTRODUCTION

The main reason for this paper is to set down what is now known of the present status of the birds of the Arusha National Park, so that comparisons may be made by other ornithologists in the future. The area being a National Park, it is hoped that the main habitat changes in the future will be those of natural succession, and therefore the only avifaunal changes will be the result of these and not of the rapid destruction or alteration of environment which is occurring over much of Africa. However, some of the cultivation, overgrazing and destruction of woodland going on beyond the borders of the Park may influence the status of birds in the Park, and some mention is made of the birds and environment of these areas. The data in this paper have been accumulated over a period of nine years, but mainly during the past three while I have been working in the Park. I have also been given many notes by L.D.E.F. Vesey-FitzGerald, the Tanzania National Parks' Scientific Officer who has lived in the Park for five years, and some records are based on skins in the Park museum. Identifications of the skins of more difficult species have been made by C. W. Benson, of the Department of Zoology, Cambridge.

TOPOGRAPHY AND CLIMATE

The Arusha National Park is situated on the eastern side of Mt. Meru in north-eastern Tanzania, at 3°15'S, 37°00'E. Mt. Kilimanjaro rises some 40 km to the east. The country is generally rugged resulting from past volcanic activity, and ascends from 1400 m in the Momela Lakes and Ngongongare section (see map) to almost 4565 m at the summit of Mt. Meru. It contains a diversity of habitat, ranging from alkaline and fresh-water lakes, through bush, grassland and swamp, to forest, heath and precipitous bare cliffs.

The climate varies with the altitude and the area is within the regime of two rainy seasons, the "short rains" of November and December, and the "long rains" of mid-March to late May, although rainfall is recorded for every month. Considerable cloud-cover from April to September keeps the area green through much of the dry season. Rainfall varies from year to year and place to place. In lower, drier areas it ranges between 600 mm and 1300 mm and in Meru Crater at 2590 m between 1400 mm and 2400 mm. Temperature records have not been kept, but generally the Park is temperate compared with the rather arid surroundings of Masailand. The hottest season is in January and February with temperatures rarely exceeding 27°C. In the cold season, June to August, temperatures at midday do not drop much below 15°C. Strong winds blow from January to March and July to October. On the higher parts of Mt. Meru of course, temperatures are lower, frost occurring at night in Meru Crater during the cold season.


ARUSHA NATIONAL PARK
N
0 1 2 3 miles
0 1 2 3 km
Meru Summit
Ash Cone
Little Meru
MT. MERU
MERU CRATER
Jekukumia R.
Ngarenanyuki R.
Nasula R.
Momela Lodge
Park HQ
Trappe Farm
MOMELA
Lendoiyo Swamp
L. Kusare
L. Elkekhotoito
Small Momela Lake
Kinandia Swamp
L. Lekandiro
L. Tulusia
Big Momela Lake
L. Rishateni
L. Longil
Lokie Swamp
Seneto Pools
SENETO
NGONGONGARE
Majiya Chai R.
Ngurdoto Gate
Ngurdoto Crater

HABITATS AND VEGETATION

No detailed description of the vegetation of the area has yet been published, but L.D.E.F. Vesey-FitzGerald has allowed me to study his manuscript (in preparation). The habitats are listed below in some detail with notes on possible future trends.

Permanent Water

Strongly alkaline lakes: Big Momela, Rishateni, Tulusia and Lekandiro.

These deep lakes are rich in algae, other plankton and at times Chironomid larvae, but no fish and few frogs. The waters are very clouded, and are rarely visited by Great Crested Grebes *Podiceps cristatus*, Reed Cormorants *Phalacrocorax africanus*, White Pelicans and Herons, Ardeidae, which feed mainly on frogs (*Xenopus spp.*) in clearer waters. Ducks, Anatidae and Little Grebe *Podiceps ruficollis* are numerous in their seasons except in some years when the waters turn yellow and smell strongly of sulphur, probably the result of the death and decay of the blue-green algae.

Less alkaline lakes: Small Momela, Kusare and Elkekhotoito.

All three lakes have no fish, but plenty of frogs at times, and are much frequented by those birds noted as rare in the strongly alkaline lakes. Small Momela is deep, the two others are shallow. Kusare occasionally supports a heavy growth of water-weed, at which time ducks and geese congregate, and Jacanas *Actophilornis africanus* breed.

Fresh lakes: Longil.

Lake Longil supports a floating sudd of Papyrus and a population of introduced fish. Very few aquatic birds are seen there, for which I can find no satisfactory reason except that the water is strongly coloured.

Streams: The Ngarenanyuki, Jekukumia, Nasula, Maji-ya-Chai and numerous smaller ones.

They are swift-running, their waters are variously fresh, alkaline or salt, and contain little aquatic growth and no fish, except in the Maji-ya-Chai.

Temporary Water

Rainwater pools, the larger being Seneto Pools and Kiwanja-ya-Mateo. These are mostly in the forest and what had been forest. During dry years they are edaphic grass glades, but after good rains fill up and acquire a cover of water-lilies and weed, and a fringing growth of sedges. They are then much frequented by water-fowl, especially Little Grebe, White-backed Duck *Thalassornis leuconotus*, Red-bill Duck *Anas erythrorhyncha*, Egyptian Goose *Alopochen aegyptiacus*, Spurwing Goose *Plectropterus gambensis*, Black Crake *Limnocorax flavirostra*, African Moorhen *Gallinula chloropus*, Red-knobbed Coot *Fulica cristata* and Jacana. A limited amount of breeding takes place. As the waters recede, Buffalo *Syncerus caffer* (Sparmann), Bush Pig *Potamochoerus porcus daemonis* Major and Bushbuck *Tragelaphus scriptus* (Pallas) eat the water-lilies and many of the birds depart.

Swamps

Fresh swamps containing tall plants such as papyrus, *Miscanthidium violaceum* (K. Schum) Robyns and *Cyperus immensus* C. B. Cl. Alkaline swamps or lake margins of the shorter *Cyperus laevigatus* L.

Lake Shores

With the fall of water-levels, a margin of mud is exposed, providing the main habitat of Palaearctic waders.

Grassland

Derived tussock grass on the laharic monticules of the Momela area of which the main components are *Cymbopogon afronardus* Stapf and *Sporobolus greenwayi* Napper, and the short-grass lawns which have been kept open by buffalo grazing.

Derived grassland on the lower slopes of Mt. Meru, a mosaic of tussocky *Eleusine jaegeri* Pilg. and short-cropped *Exotheca abyssinica* (A. Rich.) Anderss. and *Cynodon dactylon* (L.) Pers.

Short alkaline grass swards of *Sporobolus spicatus* (Vahl) Kunth bordering the soda lakes, often with bare patches of alkaline soil.

Secondary Vegetation

"Sage-bush": This is a term we have given to the mixture of *Leucas grandis* Vatke, *Ocimum suave* Willd., *Lantana viburnoides* (Forsk.) Valh., *Lippia javanica* (Burm.f.) Spreng, *Hoslundia opposita* Vahl, *Vernonia lasiopus* O. Hoffm. and other shrubs which have replaced the destroyed forest, thicket and woodland below 1680 m. It is an important habitat covering a large area. In the drier areas (Momela) it is short, combined with tussock-grass on the hillocks and is scattered with *Acacia sieberiana* D.C., *A. xanthophloea* Benth., *Croton macrostachyus* Hochst. ex Del. and other trees which sometimes form copses on steeper hillsides. In the wetter parts about Seneto and Ngongongare it is taller, thicker, with some regeneration of forest trees, clumps of secondary trees and forest remnants.

Dodonea scrub: This covers an area of boulder beds spread by the Ngarenanyuki river at the base of Mt. Meru, which once supported a woodland of cedar *Juniperus procera* Hochst. ex Endl., but was reduced by fire and felling to a thin woodland/scrub of *Dodonea viscosa* (L) Jacq. and scattered relict cedars.

Woodland

This term applies to the groves of mature Yellow-bark Acacias *Acacia xanthophloea* which grow in moist hollows, on the perimeter of some lakes and along the lower part of the Ngarenanyuki. The most extensive stand is found round the shores of Lake Elkekhotoito where it is mixed with regenerating forest trees.

Regenerating *A. xanthophloea* scrub.

An important habitat composed of young Yellow-bark Acacia trees up to 5 m tall, growing round lake-shores.

Forest

Dry evergreen forest existing from 1500 m to 1700 m, characterised by *Diospyros abyssinica* (Hiern) F. White *Olea welwitschii* (Knobl.) Gilg & Schellenb., *O. hochstetteri* Baker, (loliondo) and *O. africana*. In places it is fairly open, but there are thickets and tangle of undergrowth and regeneration.

Sub-montane or mountain evergreen mist forest, occurring from 1700-1800 m on Ngurdoto crater rim and up to 2100 m, on Mt. Meru. On Ngurdoto characteristic trees are *Cassipourea malosana* (Baker) Alston, *Tabernaemontanum* and *Casearia* on Meru, *Olea hochstetteri* is dominant. There is heavy undergrowth in much of this type of forest, and the trees are festooned with epiphytes.

Montane Forest: From 2100 m to 2600 m is a forest of tall *Juniperus* and *Podocarpus gracilior* Pilger, generally with an open, grazed floor, but in parts with an understorey of broad-leaved evergreen trees. Above this type of forest, on the steep slopes of the rim, mainly on the northern arm of the caldera wall are relict *Hagenia abyssinica* (Bruce) J. F. Gmel. trees and a growth of tall *Crotalaria agatiflora* Schweinf. shrubs.

Forest edge

A complex of trees, shrubs and bracken bordering the forest from 1680-2260 m.

Heath Zone

Represented mainly in, above, and just below Meru Crater. The co-dominant shrubs are *Erica arborea* L. *Stoebe kilimandscharica* O. Hoffm. which form thickets 3-4 m high, traversed by grassy lanes and glades, with emergent trees including *Agauria salicifolia* (Comm. ex Lam.) Hook.f. and *Juniperus.*

Special Sites

Cliffs, Waterfalls, Buildings, Large Mammals.

HABITAT AND AVIFAUNAL CHANGES IN THE PARK

The main areas of habitat change in the Park will be in the "sage-bush", parts of which will become pasture through the influence of grazing pressure by buffalo thus attracting additions to the presently few grassland species of birds, and the wetter areas will resolve through secondary and forest-tree regeneration back to woodland and forest. It's doubtful however that all the "sage-bush" will disappear. The *Dodonea viscosa* scrub, with fire-protection, will eventually give place to cedar woodland with an understorey of other regenerating forest trees. The increase of buildings at the Park headquarters will provide a niche for more Barn Owls *Tyto alba*, Swifts Apodidae, African Pied Wagtails *Motacilla aguimp*, Swallows Hirundinidae, Redwing Starlings *Onyochognathus morio*, and Scarlet-chested Sunbirds *Chalcomitra senegalensis*. The Grey-headed Sparrow *Passer griseus* which nests beyond the Park border may also be attracted. The continued tranquility in the Park and decrease of it outside, may encourage the more mobile birds such as predators and water-fowl to breed in increasing numbers in the Park, and perhaps additional species will take residence.

Slight changes in the avifauna have been observed in recent years, some of which may not be permanent. The first is the apparent loss of the Palm Swift *Cypsiurus parvus* which used to frequent the mature *Phoenix reclinata* palms, now mostly destroyed by elephants except in the ravines. In 1969, a pair of Crested Francolin *Francolinus sephaena* with young were found; these are birds normally of the thorn-bush beyond our borders. The Rattling Cisticola *Cisticola chiniana* at one time a visitor is now also a resident, and with the increase of grassland the Rufous-naped Lark *Mirafra africana* and Pangani Longclaw *Macronyx aurantiigula* have increased in numbers. The older Park buildings became the nesting sites of Wire-tailed Swallows *Hirundo smithii* in 1968 followed by Mosque Swallows *Hirundo senegalensis* which took over some of their nests a few months later. In 1970 a Wire-tailed Swallow's nest which had been taken over by a Mosque Swallow was commandeered by a pair of White-rumped Swifts *Apus caffer*, also a new breeding species to the Park (Beesley 1971a). Squabbles were frequent. The African Pied Wagtail and Scarlet-chested Sunbird also began nesting on buildings in 1968. The Blue-capped Cordon-blue *Uraeginthus cynocephalus* and Purple Grenadier *Granatina ianthinogaster* were not recorded before 1969, but during that year many were seen, some stayed for three months, and the latter species may have bred. Nine months after

clearing an area of bush, some 100 hectares in ext^nt, which became much frequented by herds of buffalo and other game, a pair of Crowned Lapwings *Stephanibyx coronatus* took up residence and nested in September 1970. Previously this bird had been a rare visitor from the short grass grazing land just beyond the Park borders.

BREEDING

Of the 191 resident birds, 12 visitors that sometimes breed and 6 breeding migrants, only 133 species have been seen nesting, and in some species only one nest has been found so far. With these few records it is difficult to give a clear picture of the breeding seasons; some tentative observations may be made however. The smaller birds, which feed either themselves or their young on insects appear to lay their eggs from one to three weeks before the beginning of each of the two rainy seasons, usually in February and October, thus rearing the young during the first part of the rains. Very little breeding takes place in the cold season of June, July and August. However, after the failure of the short rains in 1970 and the drying up of the Park throughout the beginning of 1971 until mid-March when the long rains started, there was a great amount of breeding during the long rains in April and May, and in the cold month of June. Predators, such as have been found breeding, the plovers Charadriidae, game-birds Phasianidae and the nightjars Caprimulgidae nest in the dry seasons, although some of the Helmeted Guinea-fowls *Numida mitrata* and Augur Buzzards *Buteo rufofuscus* lay during the long rains.

It is apparent that many of the species have two breeding seasons, and some breed either several times or throughout the year. This, and the prolonged nesting period of some recorded species is probably the result of predation, disturbance and the variable, temperate climate with its lack of a long dry season. Predation is heavy, and I have seen many robbed nests, the work of genets *Genetta sp.*, snakes and baboons *Papio sp.* The passage and feeding of elephants *Loxodonta* destroys nests in bushes and small trees, but I have never seen a ground nest trampled by game. Without being able to study individual recognisable birds throughout the year, it would be impossible to state the number of broods that are successful.

SURROUNDINGS OF THE ARUSHA NATIONAL PARK

Where the Park borders the forests of Mt. Meru and Ngurdoto Crater, the country beyond is a continuation of this forest, changing only in type with descending altitude. Much of the old forest has been and is still being cleared. Towards Usa River at 1130 m and Lake Duluti at 1300 m the original forest and woodland is confined to small relict patches and gallery forest along the streams. Most of the birds inhabiting these areas are found in the Park, but there are a few exceptions, namely the Bat-eating Buzzard *Machaerhamphus alcinus* Westerman, Northern Brownbul *Phyllastrephus strepitans* (Reichenow), Zanzibar Sombre Greenbul *Andropadus importunus* (Vieillot), Ashy Flycatcher *Alseonax cinereus* (Cassin) and Peter's Twinspot *Hypargos niveoguttatus* (Peters), (Beesley 1967). These species probably have altitudinal limits. It should be noted also that the Little Greenbul *Eurillas virens*, Drongo *Dicrurus adsimilis* and Red-headed Weaver *Anaplectes melanotis* which breed commonly in these lower areas are only occasional visitors to the Park.

To the north and east of the Park, the laharic monticules and dells clothed in sage-bush merge into a mixture of even drier sage-bush, tussock-grass, cultivation and grazing land. Just outside the Park, although many of the bush-grassland birds are the same, there is a rather sudden change, the colonisers from the woodland and forest-edge such as the Yellow Fly-catcher Warbler *Chloropeta natalensis*, Stonechat *Saxicola torquata*, Singing Cisticola *Cisticola cantans* and Tropical Boubou *Laniarius aethiopicus* are absent, but the species typical of dry open country and cultivation are more common. The most striking difference in birds is found in an arc beginning only five kilometres to the north

of the boundary, a country composed mainly of *Acacia tortilis* (Forsk.) Hayne wooded grassland, alkaline short-grass plains along the Ngarenanyuki river and *Acacia mellifera* (Vahl) Benth.-*Commiphora africana* (A. Rich.) Engl. bush interspersed with other edaphic short-grass plains which stretches northwards to, and beyond, the Kenya border. Here, between five and fifteen kilometres from our boundary, 58 species not yet recorded in the Park are found breeding, and a further 30 which are but rare visitors to the Park. The former birds are listed below.

Ostrich *Struthio camelus* Linn.
Lanner Falcon *Falco biarmicus* Temminck
White-eyed Kestrel *Falco rupicoloides* A. Smith
Pigmy Falcon *Poliohierax semitorquatus* (A. Smith)
Pale Chanting Goshawk *Melierax poliopterus* Cabanis
Yellow-necked Spurfowl *Pternistis leucoscepus* (Gray)
Kori Bustard *Ardeotis kori* (Burchell)
White-bellied Bustard *Eupodotis senegalensis canicollis* (Reichw.)
Crested Bustard *Lophotis ruficrista* (Smith)
Two-banded Courser *Hemerodromus africanus* (Temm.)
Pratincole *Glareola pratincola* (Linn,)
Chestnut-bellied Sandgrouse *Pterocles exustus* Temminck & Langier
White-bellied Go-away Bird *Corythaixoides leucogaster* (Ruppell)
Yellow-collared Love-bird *Agapornis personata* Reichenow
Grey Hornbill *Tockus nasutus* (Linn.)
Von der Decken's Hornbill *Tockus deckeni* (Cabanis)
Abyssinian Scimitar-bill *Rhinopomastus minor* (Ruppell)
Long-tailed Nightjar *Scotornis climacurus* Vieillot
White-headed Mousebird *Colius leucocephalus* Reichenow
Black-throated Barbet *Tricholaema melanocephalum* (Cretz.)
Red-and-Yellow Barbet *Trachyphonus erythrocephalus* Cabanis
D' Arnaud's Barbet *Trachyphonus darnaudii* (Prevost & Des Mrs)
Singing Bush-Lark *Mirafra cantillans* Hawker
Fawn-coloured Lark *Mirafra africanoides*. A. Smith
Pink-breasted Lark *Mirafra poecilosterna* (Reichw.)
Short-tailed Lark *Pseudalaemon fremantlii* (Phillips)
Little Tawny Pipit *Anthus caffer* Sundevall
Banded Tit-Flycatcher *Parisoma boehmi* Reichw.
Pale Flycatcher *Bradornis pallidus* (Muller)
Grey Flycatcher *Bradornis microrhynchus* Reichw.
South African Black Flycatcher *Melaenornis pammelaina* (Stanley)
Spotted Morning Warbler *Cichladusa guttata* (Heuglin)
Grey Wren Warbler *Calamonastes simplex* (Cabanis)
Yellow-bellied Eremomela *Eremomela icteropygialis* (Lafresnaye)
Tiny Cisticola *Cisticola nana* Fischer & Reichenow
Asy Cisticola *Cisticola cinereola* Salvadori
Teita Fiscal Shrike *Lanius dorsalis* Cabanis
Long-tailed Fiscal Shrike *Lanius cabanisi* Hartert
Slate-coloured Boubou *Laniarius funebris* (Hartlaub)
Rosy-patched Shrike *Rhodophoneus cruentus* (Hemprich & Ehrenberg)
Fischer's Starling *Spreo fischeri* (Reichenow)
Superb Starling *Spreo superbus* (Ruppell)
Violet-backed Sunbird *Anthreptes longuemarei* (Lesson)
Red-billed Buffalo-Weaver *Bubalornis niger* Smith
White-headed Buffalo Weaver *Dinemellia dinemelli* (Ruppell)
Stripe-breasted Sparrow-Weaver *Plocepasser mahali* Smith
Grey-headed Social Weaver *Pseudonigrita arnaudi* (Bonaparte)
Yellow-spotted Petronia *Petronia xanthosterna* (Bonaparte)
Speckle-fronted Weaver *Sporopipes frontalis* (Daudin)
Vitelline Masked Weaver *Ploceus vitellinus* (Lichtenstein)
Black-necked Weaver H*yphanturgus nigricollis* (Vieillot)
Cut-throat *Amadina fasciata* (Gmelin)
Green-winged Pytilia *Pytilia melba* (L.)
Indigo-bird *Nypochera* sp.
Steel-blue Whydah *Vidua hypocherina* Verreaux
Fischer's Whydah *Vidua fischeri* (Reichenow)
White-bellied Canary *Serinus dorsostriatus* (Reichenow)
Kenya Grosbeak Canary *Serinus buchanani* Hart

STATUS OF THE SPECIES

Four hundred and eleven species of birds have so far been recorded. In the systematic list they follow the order and enumeration employed in "Birds of Eastern and North-Eastern Africa" by Mackworth-Praed and Grant, second edition. Their status is classified in the following manner.

Residents: at present 191 species are thus described. They are birds which are present throughout the year, and some of these species have their numbers augmented by visitors. Ducks and Geese are not included in this category, with the exception of the Black Duck and possibly African Pochard, Spurwing-Goose and Egyptian Goose, as it is not known whether the few that do breed are not merely visitors.

Palaearctic migrants: 62 species are recorded, most of which are transients. Waders form the largest biomass of the migrants, and many of these stay throughout the northern winter months.

Breeding Visitors: six species migrate to the Park for breeding purposes only.

Visitors: In this category there are 153 species, all of which are African (Ethiopian) species with the sole exception of the Madagascar Squacco Heron *Ardeola idae.* Those described as regular visitors come every year at more or less defined times, or appear almost every month.

SYSTEMATIC LIST

2. *PODICEPS CRISTATUS* L. Great Crested Grebe.
A regular, but usually transient visitor, occurring on the less alkaline lakes from July to December. Up to 12 birds recorded at once.

3. *PROCTOPUS CASPICUS* (Hablizl). Black-necked Grebe.
Two seen on Great Momela lake in October 1968. This has been found breeding at Eluanata dam, 64 km east of the Park.

4. *PODICEPS RUFICOLLIS* (Pallas). Little Grebe.
A small number of residents are augmented by many visitors, up to 7,000 having been recorded. Numbers of immigrants vary from year to year, and are normally highest during the dry season.
Habitat. Any still water.
Breeding. Probably whenever conditions are suitable. Nests with eggs found on the following dates; 18.12.68, 21.5.69, 9.8.69, 10.4.70, 5.5.70, 4.5.71, 30.5.71.
Small young seen as follows; 19.8.68, 20.9.68, 2.2.69, 31.5.71, Up to five eggs are laid.

25. *PHALACROCORAX CARBO* L. Cormorant.
A rare visitor to less alkaline lakes.

27. *PHALACROCORAX AFRICANUS* (Gmelin). Long-tailed Cormorant.
A regular visitor, numbering up to 70. Found throughout the year, but mainly from November to May.
Habitat. Less alkaline lakes and rainwater pools, where it feeds on frogs. For some reason it is rarely found on Lake Longil, although there are plenty of fish.

28. *ANHINGA RUFA* (Lacepede & Daudin). African Darter.
A couple seen on Small Momela lake in October 1968. The rarity of this species and the Cormorant is strange as food is available. Possibly they resent cloudy water.

31. *PELECANUS ONOCROTALUS* L. White Pelican.
A fairly regular visitor to the less alkaline lakes in any month. Flocks of up to 60 birds recorded.

32. *PELECANUS RUFESCENS* Gmelin. Pink-backed Pelican.
Recorded in October, 1965, December, 1970, and March to the end of April, 1971.

33. *ARDEA CINEREA* L. Grey Heron.
A regular visitor in small numbers during every month to water's edge or swamp.

34. *ARDEA MELANOCEPHALA* Vigors & Children. Black-headed Heron.
As previous species, but more numerous during rains.

36. *PYRRHERODIA PURPUREA*(L.) Purple Heron.
A rare visitor to the water's edge.

37. *CASMERODIUS ALBUS* (L.) Great White Egret.
A regular visitor, less common than the Grey Heron. Seen all months, but rarely June and July. Frequents rainwater pools, less alkaline lake edges and swamps.

38. *MELANOPHOYX INTERMEDIUS* (Wagler). Yellow-billed Egret.
As other Ardeidae but more numerous.

40. *EGRETTA GARZETTA* (L.) Little Egret.
A rare visitor, recorded in June and December to swampy edges of rainwater pools.

42. *BUBULCUS IBIS* (L). Buff-backed Heron.
A regular visitor to buffalo herds in Ngurdoto Crater, where the buffalo stay in open grassland and swamp during the day. The bird is sporadic elsewhere, as in other areas the buffalo lie up during the day in cover.

43. *ARDEOLA RALLOIDES* (Scopoli). Squacco Heron.
A regular visitor in small numbers from early June to early November, odd birds being seen in February and March. Some of these birds may be the Madagascar Squacco Heron, but without obtaining several specimens, the status of the latter species is uncertain. Prefers rainwater pools with sedges and water-lilies.

44. *ARDEOLA IDAE* (Hartlaub). Madagascar Squacco Heron.
The only definite records are birds seen in breeding plumage, one October 2, 1968 and one October 21, 1969. (Beesley 1971a).

45. *BUTORIDES STRIATUS* (L.) Green-backed Heron.
A rare visitor, recorded in January, April, October and December, to lake shores overhung by bushes. Regular, however, to the Maji-ya-Chai where there are fish.

48. *NYCTICORAX NYCTICORAX* (L.) Night Heron.
Probably both a Palaearctic and African migrant, as it occurs in any month. The highest numbers (up to 20) occur from March to June and August to November. Many birds are juveniles.

50. *IXOBRYCHUS MINUTUS* (L.) Little Bittern.
One only seen, on 12.6.67, probably the African race.

51. *ARDEIRALLUS STURMII* (Wagler). Dwarf Bittern.
Rare visitor, singletons recorded in February, March, October and November to rainwater pools.

53. *SCOPUS UMBRETTA* (Gmelin). Hammerkop.
A resident, frequenting forest pools, swamps and streams, and Ngurdoto Crater. Lays eggs in April or May.

55. *CICONIA CICONIA* (L.) White Stork.
A Palaearctic migrant, visiting grassland and lake shores rarely; between October and May.

56. *CICONIA NIGRA* (L.) Black Stork.
A Palaearctic migrant, a single bird being seen each year since 1965 between October and March, frequenting temporary pools in forest and grassland (Beesley 1971a).

57. *DISSOURA EPISCOPUS* (Boddaert). Woolly-necked Stork.
A rare visitor, either solitary or in pairs from September to February and in June in the grassland and swamp edge of Ngurdoto Crater, and rarely, other swamps.

59. *ANASTOMUS LAMELLIGERUS* Temminck. Open-bill.
Once recorded. Undated.

60. *EPHIPPIORHYNCHUS SENEGALENSIS* (Shaw). Saddle-bill Stork.
A resident, frequenting swamps, rainwater pools and flooded grassland. One nest was found with an egg in early May 1970 and the same nest again contained an egg in April 1971.

61. *LEPTOPTILOS CRUMENIFERUS* (Lesson). Marabou.
A rare visitor, associating with vultures on carcasses.

62. *IBIS IBIS* (L.) Yellow-billed Stork.
A regular visitor in small numbers during all months to the margins of less alkaline lakes and rain-water pools.

63. *THRESKIORNIS AETHIOPICUS* (Latham). Sacred Ibis.
A regular visitor, occasionally up to 500 birds, occurring all months at the edge of any less alkaline lakes and swamps.

65. *HAGEDASHIA HAGEDASH* (Latham). Hadada Ibis.
Resident, also a regular visitor, pairs or parties to any wet place. A nest found on Jamara-Maji-ya-Chai river in the Ngongongare section in November contained one egg.

68. *PLEGADIS FALCINELLUS* (L.). Glossy Ibis.
One record only. Undated.

70. *PLATALEA ALBA* Scopoli. African Spoonbill.
A regular visitor in any month to forest pools and less alkaline lakes in woodland (Kusare, Elkekhotoito.)

71. *PHOENICOPTERUS RUBER* (L.) Greater Flamingo.
Frequent visitor but irregular, sometimes in several hundreds, occurring any month but less frequently from May to September. They feed in the shallow edges of strongly alkaline lakes.

72. *PHOENICONAIAS MINOR* (Geoffroy) Lesser Flamingo.
As previous species, not quite so frequent, numbers vary from a score to a thousand. Preferred habitat is Lake Tulusia where they feed while swimming in deep water. If conditions are suitable, they may stay for five or six months.

73. *OXYURA MACCOA* (Eyton). Maccoa Duck.
A regular visitor, mainly during the dry season, and sometimes up to a thousand birds are present. Found only on strongly alkaline lakes.

74. *THALASSORNIS LEUCONOTUS* (Eyton). White-backed Duck.
A regular visitor, and possibly a resident, numbering from a few to eighty birds. Most frequent when the rainwater pools are full and water-lilies are abundant. Eggs found from August to January.
Notes. Frequently utters a low crooning note, not mentioned by Mackworth-Praed & Grant.

76. *AYTHYA FERINA* (L.). European Pochard.
One female recorded on forest pond from January 1, 1971 to February 12, 1971 (Beesley 1971b). A very rare visitor to East Africa, not yet recorded from Kenya.

77. *AYTHYA ERYTHROPHTHALMA* (Weid). African Pochard.
A regular visitor, mainly during the dry seasons when up to 1500 birds present. Recorded breeding once only, very small young being seen in July.
Habitat: prefers strongly alkaline lakes, but in some years uses other waters, including rainwater pools. Spends much time resting on shore.

78. *AYTHYA FULIGULA* (L.). Tufted Duck.
A rare Palaearctic migrant to lakes.

80. *SPATULA CLYPEATA* (L.). European Shoveler.
Palaearctic migrant, 20 to 50 birds visiting less alkaline lakes, October to February.

83. *ANAS UNDULATA* Dubois. Yellow-billed Duck.
A rare visitor, to any water, transient and usually in pairs in July and November.

84. *ANAS SPARSA* (Eyton). Black Duck.
A few pairs are resident on the streams on Mt. Meru up to 2600 m, and descend to rainwater pools at times. Six very small young were found with the parents at 2500 m on 17.7.68.

86. *ANAS PENELOPE* (L.). Wigeon.
Palaearctic migrant, irregular in small numbers, to less alkaline lakes.

88. *ANAS QUERQUEDULA* (L.). Garganey.
Palaearctic migrant, a few occurring from January to May, but usually on return migration. Frequents rainwater pools and the wood-bordered less alkaline lakes.

89. *ANAS CAPENSIS* (Gmelin). Cape Wigeon.
A regular visitor, and possibly resident, up to 500 birds being present during the dry season. A few pairs breed on islands, nests found on 20.3.69 and 13.10.68. Six very small young seen on 1.10.67. Flightless birds seen in July. Habitat: strongly alkaline lakes.

90. *ANAS PUNCTATA* (Burchell). Hottentot Teal.
An irregular but frequent visitor in small numbers to rainwater pools and lake margins.

91. *ANAS ERYTHRORHYNCHA* (Gmelin). Red-bill.
A regular visitor, possibly resident in small numbers. It is most numerous during the dry season, up to 300 being recorded, and frequents any still water. Nest found 7.4.69, and very small young seen on 2.2.69 and 7.9.68.

92. *ANAS ACUTA* (L.). Pintail.
A Palaearctic migrant, up to 200 birds, found on any still water.

94. *DENDROCYGNA VIDUATA* L. White-faced Tree-Duck.
Irregular but not infrequent visitor to less alkaline waters with plenty of aquatic weed.

95. *DENDROCYGNA BICOLOR* (Vieillot). Fulvous Tree-Duck.
A vagrant, not seen since 1967.

98. *SARKIDIORNIS MELANOTOS* (Pennant). Knob-billed Goose.
Irregular visitor in pairs or small parties to rainwater pools from October to February and in June/July.

99. *ALOPOCHEN AEGYPTIACUS* (L.). Egyptian Goose.
Possibly resident, but a regular visitor, up to 300 occurring when fruiting grasses and weed are abundant on less alkaline waters. Also frequents strongly alkaline lakes. Breeds probably from April to October, nests recorded as follows:—13.10.68, 7.4.69, and very small goslings seen in 21.9.68, 13.10.68, 10.6.69 and 10.7.69.

100. *PLECTROPTERUS GAMBENSIS* (L.) Spur-winged Goose.
A previous species, but less numerous, and does not frequent strongly alkaline water. Breeds from April to July, found nesting on 26.6.69, 10.4.70 and 17.6.70. Very small goslings seen on 1.5.69, 2.6.69 and 20.7.69, and 10.6.71.

103. *SAGITTARIUS SERPENTARIUS* (Miller). Secretary Bird.
A rare visitor to open grassland.

106. *GYPS RUPPELLII* (Brehm). Rüppell's Griffon Vulture.
One or two occasionally accompany the other Vultures to a carcass.

107. *PSEUDOGYPS AFRICANUS* (Salvadori). White-backed Vulture.
Visitor. Occasionally seen passing over on patrol, but up to 200 will congregate at a carcass.

108. *TORGOS TRACHELIOTUS* (Forster). Lappet-faced Vulture.
A rare visitor to carcasses.

109. *TRIGONOCEPS OCCIPITALIS* (Burchell). White-headed Vulture.
As previous species.

110. *NEOPHRON PERCNOPTERUS* (L.) Egyptian Vulture.
One pair resident, probably nesting on cliffs of Ngurdoto Crater, but feeding mainly outside the Park.

111. *NECROSYRTES MONACHUS* (Temminck) Hooded Vulture.
A rare visitor to carcasses.

112. *FALCO PEREGRINUS* Tunstall. Peregrine.
Two pairs resident. Frequents any open country up to 3000 m. Seen feeding downy young in September.

115. *FALCO SUBBUTEO* L. Hobby.
Palaearctic migrant, mainly singletons hunting in open country and over lakes.

116. *FALCO CUVIERI* Smith. African Hobby.
An uncommon visitor to the forest edge and uplands grassland, rarely woodland and lakes.

120. *FALCO AMURENSIS* Radde. Eastern Red-footed Falcon.
One seen feeding on flying ants with Hobbies on 24th November, 1970.

126. *FALCO NAUMANNI* Fleischer. Lesser Kestrel.
Palaearctic migrant, infrequent and transient, the main route being through the Sanya plains to the east where large congregations can be seen in April. After a fire in the Park in March 1971, many came in, and stayed on for several days.

130. *AVICEDA CUCULOIDES* Swainson. Cuckoo Falcon.
A few pairs resident in woodland and forest-edge. A juvenile seen in June.

132. *MILVUS MIGRANS* (Boddaert). Black Kite.
Singletons pass through regularly in October and November, rarely December and January. They are yellow-billed birds, outliers of the big flocks that pass through Arusha and Moshi. In March 1971 however, bush fires attracted many, two of which were seen to be black-billed.

133. *ELANUS CAERULEUS* (Desfontaines). Black-shouldered Kite.
A rare visitor in June and November.

138. *AQUILA NIPALENSIS* Hodgson. Steppe Eagle.
A Palaearctic migrant seen regularly, often in small parties, in any country except forest.

139. *AQUILA RAPAX* (Temminck). Tawny Eagle.
A regular visitor, sometimes breeding. Eggs laid in early June 1969. Frequents open country.

142. *AQUILA WAHLBERGI* Sundevall. Wahlberg's Eagle.
A couple were seen on passage at the forest edge below 1700 m in early October 1970 and a singleton in woodland in late October 1970.

143. *HIERAAETUS SPILOGASTER* (Bonaparte). African Hawk Eagle.
A rare visitor to woodland and forest edge to 2500 m from April to July.

145. *HIERAAETUS PENNATUS* (Gmelin). Booted Eagle.
Palaearctic migrant, once recorded on 19.3.70.

146. *POLEMAETUS BELLICOSUS* (Daudin). Martial Eagle.
Rare visitor from Acacia steppe.

147. *STEPHANOAETUS CORONATUS* (L.) Crowned Hawk-Eagle.
Resident, three or four pairs, in woodland and forest up to 2400 m.

149. *LOPHOAETUS OCCIPITALIS* (Daudin). Long-crested Hawk-Eagle.
Irregular but frequent visitor to forest edge and woodland, rarely open country, up to 2,000 m.

153. *CIRCAETUS CINEREUS* Vieillot. Brown Harrier-Eagle.
A regular visitor, single birds being seen from September to April. A juvenile seen in February and March. Frequents wooded grassland along the lower stretch of the Ngarenanyuki river and sage-bush around the Momela lakes.

154. *CIRCAETUS PECTORALIS* Smith. Black-chested Harrier-Eagle.
A vagrant from grass plains to the north.

158. *BUTASTUR RUFIPENNIS* (Sundevall). Grasshopper Buzzard.
A rare transient from December to March, not occurring every year.

159. *TERATHOPIUS ECAUDATUS* (Daudin). Bateleur.
One pair resident, seen building a nest in April, 1969, and brooding eggs in another nest in April, 1971.

160. *CUNCUMA VOCIFER* (Daudin). Fish Eagle.
One pair resident. Eggs laid in July 1967, June 1969, May 1970 and April 1971, at the Lake Elkekhotoito eyrie, but feeds mainly on Lake Silversea, just outside the Park and at Lake Longil.

161. *GYPOHIERAX ANGOLENSIS* (Gmelin). Palm-nut Vulture.
One undated record only. A vagrant probably from the Moshi-Taveta district.

162. *GYPAETUS BARBATUS* (L.) Lammergeyer.
Probably resident, possibly breeds in Meru caldera, but feeds mainly outside the Park. Frequently seen on Mt. Meru over heath-zone and upland grassland.

163. *BUTEO VULPINUS* (Gloger). Steppe Buzzard.
Palaearctic migrant in small numbers, passing at foot of Mt. Meru in October and January.

165. *BUTEO OREOPHILUS* Hartert & Neumann. Mountain Buzzard.
Several pairs are resident, inhabiting the forests. A nest containing two well-feathered young found on 12th December 1968.

167. *BUTEO RUFOFUSCUS* (Forster). Augur Buzzard.
Common resident, and with exception of closed forest ubiquitous to 2,700 m. Nests with eggs found on the following dates; 29.11.67, 10.3.69, 23.3.69, 15.4.69, 2.9.69, 5.4.70, 20.5.70, 6.7.70, 20.4.71, 23.4.71, 15.5.71, 13.6.71 and 14.6.71. Main diet in mole-rats *Tachyorhyctes*.

170. *ACCIPITER MINULLUS* (Daudin). Little Sparrow-Hawk.
An uncommon resident in woodland and forest edge.

173. *ACCIPITER RUFIVENTRIS* Smith. Rufous Sparrow-Hawk.
Scarce resident of forest and woodland, occasionally seen in the open.

177. *ACCIPITER TACHIRO* (Daudin). African Goshawk.
A not uncommon resident of forest and woodland up to forest limit.

178. *MICRONISUS GABAR* (Daudin). Gabar Goshawk.
One record only, undated.

183. *CIRCUS MACROURUS* (Gmelin). Pale Harrier.
Rare Palaearctic migrant seen in December and April in open country around Momela lakes. Quite frequent in the great grass plains beyond the Park borders.

184. *CIRCUS AERUGINOSUS RANIVORUS* (Daud.). African Marsh Harrier.
An irregular but frequent visitor in any month to swamps, grasslands and lake-shores. Breeds at Sanya Juu outside the Park.

185. *POLYBOROIDES TYPUS* Smith. Harrier-Hawk.
Uncommon resident of woodland, and forest edge. A young bird was seen being mobbed by Hammerkops in October.

186. *PANDION HALIAETUS* (L.) Osprey.
A rare transient, seen only in June, October and December 1968, and February-March 1969.

195. *FRANCOLINUS SEPHAENA* (Smith). Crested Francolin.
Status uncertain. Normally a bird of the dry bush beyond the Park, a pair were seen with half-grown poults in the sage-bush in late May.

198. *FRANCOLINUS SHELLEYI* O. Grant. Shelley's Francolin.
A visitor to the sage-bush from the drier farmland and tree-scattered grassland to the north of the Park, and probably resident in the lower part of the Ngongongare section.

203. *FRANCOLINUS HILDEBRANDTI* Cabanis. Hildebrandt's Francolin.
A common resident in sage-bush, woodland and lower heath-zone. Nests found on 13.10.68 and 19.8.69.

204. *FRANCOLINUS SQUAMATUS* (Cassin). Scaly Francolin.
Common resident in forest, forest edge, sage-bush, and heath zone, up to 2700 m. Often overlaps with *F. hildebrandti*. Nests found on 26.12.68 and 10.10.69 and very small young seen on 23.11.67, 6.10.68, 30.9.69 and 22.2.69.

212. *COTURNIX DELEGORGUEI* Delegorgue. Harlequin Quail.
Regular transient visitor, singletons being seen in November, December and February, and April to June in grassland. In Masailand it breeds in grassland or fields of crops and weeds from March to July.

215. *NUMIDA MITRATA* Pallas. Helmeted Guinea-Fowl.
A resident of the sage-bush, emerging to feed and drink in the open in the evening. Nests found on 18.3.69, 5.12.69 and 25.2.70. Small young seen in January to May.

222. *RALLUS CAERULESCENS* (Gmelin). Kaffir Rail.
One record only, undated.

225. *LIMNOCORAX FLAVIROSTRA* (Swainson). Black Crake.
Resident and visitor. Prefers less alkaline water with plenty of cover. Is commoner and breeds when water plants are abundant on rainwater pools. Nests found on 13.7.69, and very small young on 2.2.69, 7.4.69.

237. *PORPHYRIO ALBA* (White). Purple Gallinule.
A rare visitor to long-grass swamps, recorded once in September and once in January.

239. *GALLINULA CHLOROPUS* (L.) African Moorhen.
Status as Black Crake, but less common. Very small young found on 17.4.69 and 21.5.69.

240. *GALLINULA ANGULATA* Sundevall. Lesser Moorhen.
A rare visitor to swampy pools, yet breeds only 4 km from the Park. In May-June 1971, three pairs and two juveniles were seen.

242. *FULICA CRISTATA* Gmelin. Red-Knobbed Coot.
Regular visitor and probably resident on Sceneto Pools. Habitat similar to other Rallidae, but also frequents alkaline lakes. Two pairs building nests on 25.6.71.

245. *BALEARICA REGULORUM* (Bennet). South African Crowned Crane.
One pair resident, up to 15 visitors. Feeds in open ground and breeds on a floating *Cyperus lavevigatus* swamp. Nests found as follows: Mid-March 68, 3 eggs. 11.4.69, 2 young in nest. 16.4.70, 2 young in nest. 10.4.71, 2 eggs.

258. *LISSOTIS MELANOGASTER* (Rüppell). Black-bellied Bustard.
Probably a resident in grassland of Ngongongare section, and a rare transient to the Momela area in September and December.

262. *BURHINUS CAPENSIS* (Lichtenstein). Spotted Thicknee.
A pair or two resident, occasional visitors. Inhabits and breeds in alkaline grassland. Nests found: 2 eggs on 24.9.68, 2 eggs on 7.4.69 and 2 eggs on 28.2.70.

264. *ACTOPHILORNIS AFRICANUS* (Gmelin). African Jacana.
A resident, augmented by visitors in wet years. Habitat is well-vegetated fresh swamps and rain-water pools, where it has been found breeding as follows. 3 eggs on 13.7.69, 4 eggs on 12.4.70 and 3 eggs on 12.5.71. Very young birds seen on 23.10.68, 16.12.68 and 25.7.69.

265. *MICROPARRA CAPENSIS* (Smith). Lesser Jacana.
One record only, October 1968.

266. *CHARADRIUS HIATICULA* (L). Ringed Plover.
A palaearctic migrant whose numbers as with all non-resident waders, varies with the amount of lake-shore mud exposed.

271. *CHARADRIUS PECUARIUS* Temminck. Kittlitz's Sand-Plover.
Resident, augmented by visitors which probably breed. Inhabits alkaline flats around lakes. Nests found as follows: 18.9.68 (2 nests), 23.10.68 (2 nests), 2.2.69, 12.2.69, 20.3.69, 26.6.69, 1.7.70, 8.9.70, 7.11.70 and 27.2.71, mostly with 2 eggs.

272. *CHARADRIUS TRICOLLARIS* Vieillot. Three-banded Plover.
A resident visitor, frequenting muddy lake shores or stream banks, where nests have been found from July to September and again in February. The display call is a churring rattle uttered while the bird fluffs out its white pectoral feathers.

274. *CHARADRIUS MONGOLUS* Pallas. Mongolian Sand-Plover.
Palaearctic migrant, one record only, in November 1966.

281. *STEPHANIBYX CORONATUS* (Boddaert). Crowned Lapwing.
A rare visitor which is common right up to the Park boundary on overgrazed grassland. However nine months after clearing an area of bush which became much frequented by a herd of buffalo and other game, a pair of these birds laid eggs and brought off young in September 1970.

282. *STEPHANIBYX LUGUBRIS* (Lesson). Senegal Plover.
A regular visitor in parties to the Ngongongare sector from January to April, inhabiting bush scattered grassland.

283. *STEPHANIBYX MELANOPTERUS* (Cretz.). Black-winged Plover.
A rare visitor, but common on well-grazed alkaline grassland two or three kilometres from the Park boundary, near Ngarenanyuki.

287. *HOPLOPTERUS ARMATUS* (Burchell). Blacksmith Plover.
A resident, several pairs inhabiting the alkaline grassland and *Cyperus laevigatus* swamp. Eggs laid from May to July. Two pairs reared young on a rock out in Great Momela Lake. Nests found as follows. Two on 24.6.68 with 3 and 2 eggs. 28.7.68, 2 eggs. 26.6.69, 3 eggs. 13.7.69, 3 eggs. 4.6.70, 2 eggs. 1.7.70, 2 eggs. 12.5.71, 2 eggs.

295. *RECURVIROSTRA AVOSETTA* L. Avocet.
Palaearctic and African migrant, occurring all months, but peak numbers in March-April, August-November. Inhabits alkaline lake shores.

296. *HIMANTOPUS HIMANTOPUS* (L.). Black-winged Stilt.
As previous species but more numerous, peak numbers February-April, October-November. Habitat as Avocet, but also deeper mud and water.

297. *ROSTRATULA BENGHALENSIS* (L.) Painted Snipe.
Irregular visitor, pairs and singletons haunting wet *Cyperus laevigatus* swamp and muddy rain-pools in May, July, August, September and January.

298. *CAPELLA GALLINAGO* (L.) Common Snipe.
A scarce Palaearctic migrant to wet *Cyperus laevigatus* swamp in December and January.

303. *CALIDRIS TESTACEA* (Pallas). Curlew Sandpiper.
Palaearctic migrant, small numbers passing in November and April-May. Habitat: lake shores.

305. *CALIDRIS MINUTA* (Leisler) Little Stint.
Palaearctic migrant, common on lake-shores from September to May.

309. *PHILOMACHUS PUGNAX* (L.). Ruff.
As previous species, but also frequents *Cyperus laevigatus* swamp, rainwater pools and sometimes flooded grassland.

311. *XENUS CINEREUS* (Guldenstadt). Terek Sandpiper.
Palaearctic migrant, only one record in October.

312. *TRINGA HYPOLEUCOS* L. Common Sandpiper.
Common Palaearctic migrant to any water, still or running.

313. *TRINGA OCHROPUS* L. Green Sandpiper.
Palaearctic migrant, not uncommon. More frequent in woodland pools and mountain streams than previous species.

314. *TRINGA GLAREOLA* L. Wood Sandpiper.
As previous species, but not on mountain streams.

317. *TRINGA STAGNATILIS* (Bechstein). Marsh Sandpiper.
Palaearctic migrant, small numbers occurring on lake-shores.

318. *TRINGA NEBULARIA* (Gunnerus). Greenshank.
As previous species.

319. *LIMOSA LIMOSA* (L.). Black-tailed Godwit.
Palaearctic migrant, one record only.

329. *RHINOPTILUS CHALCOPTERUS* (Temminck). Violet-tipped Courser.
Three seen on passage in Ngongongare sector on 8.4.71.

342. *LARUS CIRROCEPHALUS* Vieillot. Grey-headed Gull.
Vagrant to lakes.

361. *CHLIDONIAS LEUCOPTERA* (Temminck). White-winged Black Tern.
Uncommon Palaearctic migrant to lakes.

364. *RYNCHOPS FLAVIROSTRIS* Vieillot. Skimmer.
One resting on shore of Big Momela lake 1st May 1971.

365. *TURNIX SYLVATICUS* (Desfontaine). Button Quail.
A rare visitor in April, transient only. Breeds in weedy fallows and grassland near Arusha and Sanya plains in April and May.

370. *EREMIALECTOR DECORATUS* (Cabanis) Black-faced Sandgrouse.
Four flew over Momela section on 2.1.71.

379. *COLUMBA GUINEA* L. Speckled Pigeon.
A rare transient visitor from nearby open country.

380. *COLUMBA ARQUATRIX* Temminck & Knip. Olive Pigeon.
A common resident inhabiting forest to almost 3000 m and descending in flocks to lower woods and secondary trees, especially *Croton macrostachyus* and *Olea* species in February-March and October-November. Breeds in forest and its fringes, a nest with 2 eggs found on 20.10.68 at 2500 m, and other with 1 egg on 8.6.71 at 1700 m.

383. *TURTUROENA DELEGORGUEI* (Delegorgue). Bronze-naped Pigeon.
A not uncommon resident in forest below 2000 m and seldom seen outside closed forest or woodland. Calls mainly in May-June.

385. *STREPTOPELIA LUGENS* (Rüppell). Pink-breasted Dove.
A resident of mountain forest and heathland to 3000 m, flocking to lower levels in June to October. Feeds on ground and in canopy of forest, also in open country. A nest containing two eggs found on 17.6.71.

386. *STREPTOPELIA SEMITORQUATA* (Rüppell). Red-eyed Dove.
Abundant resident of woodland, forest-edge and clearings up to 1800 m. Breeds in low trees and bushes invariably laying 2 eggs. Nests found on the following dates: 28.9.67, 10.1.69, 18.3.69, 10.11.69, 10.10.70, 26.10.70, 11.5.71, 17.5.71, 20.5.71, 21.5.71, 3.6.71 and 4.6.71.

388. *STREPTOPELIA CAPICOLA* (Sundevall). Ring-necked Dove.
At one time a regular visitor, but now also a resident near the northern border, inhabiting the drier tree-scattered sage-bush. Abundant outside the Park in *Acacia tortilis* wooded grassland.

392. *STIGMATOPELIA SENEGALENSIS* (L.). Laughing Dove.
A regular visitor, and possibly a resident on the northern border. Habitat as the previous species.

393. *OENA CAPENSIS* (L.). Namaqua Dove.
A rare transient in December, coming down to roads and grassland.

394. *TYMPANISTRIA TYMPANISTRIA* (Temminck & Knip). Tambourine Dove.
Common resident of forest with heavy undergrowth below 1800 m, breeding in April, (one record).

397. *TURTUR CHALCOSPILOS* (Wagler). Emerald-spotted Wood-Dove.
A few pairs resident in shrubby growth under woodland.

398. *APLOPELIA LARVATA* (Temminck & Knip). Lemon Dove.
A resident occupying the floor and occasionally the canopy of closed woodland and forest below 1800 m.

401. *TRERON AUSTRALIS* (L.). Green Pigeon.
Resident and visitor, numerous at times to fruiting trees in forest and woodland. Found up to 2100 m. A nest with 2 eggs found on 23.2.71.

404. *CUCULUS CANORUS* L. European Cuckoo.
A Palaearctic migrant passing in October and November (six were seen in one day at the end of November) and returning throughout April. Frequents adult and regenerating *Acacia xanthophloea* woodland.

406. *CUCULUS SOLITARIUS* Stephens. Red-chested Cuckoo.
Resident in forest up to 2000 m, woodland and bush with scattered trees and thickets. Calls and probably breeds during the rains.

407. *CUCULUS AFER* Lichtenstein. Black Cuckoo.
A breeding visitor in small numbers, occurring in woodland and forest edge of scattered trees up to 1700 m from November to April, and rarely May. Begins calling in February.

414. *CLAMATOR LEVAILLANTII* (Swainson). Levaillant's Cuckoo.
Rare visitor in March to bush in Acacia woodland.

415. *CLAMATOR JACOBINUS* (Boddaert). Black and White Cuckoo.
A regular visitor in small numbers in November and end of January to middle of April. Inhabits young *Acacia xanthophloea* groves and bush under mature woodland.

416. *CHRYSOCOCCYX CUPREUS* (Shaw). Emerald Cuckoo.
A resident of woodland and forest up to 2100 m occasionally to 2600 m. Calls during the rains.

417. *CHRYSOCOCCYX CAPRIUS* (Boddaert). Didric Cuckoo.
A visitor to bush and woodland from December to May, not common, calling during the rains.

418. *CHRYSOCOCCYX KLAAS* (Stephens). Klaas's Cuckoo.
A visitor to forest edge and clearings up to 1830 m from October to May. Also overlaps with previous species in woodland and tree-scattered sage-bush. Calls during the rains.

423. *CENTROPUS SUPERCILIOSUS* Hemprich & Ehrenberg. White-browed Coucal.
Not uncommon resident in all types of country except forest up to 1800 m. Nests in bush or grass tussocks, laying eggs in March and November.

424. *CEUTHMOCHARES AEREUS* (Vieillot). Yellow-Bill.
Resident, difficult to see, in tangles of creepers in forest up to 1800 m. Calls in December.

432. *TAURACO HARTLAUBI* (Fischer & Reichenow). Hartlaub's Turaco.
Common resident of forest canopy and mid-storey, found up to 3000 m, rare in more open country. Breeds from August to October, nests found on 17.10.68 and 16.8.69.

444. *POICEPHALUS GULIELMI* (Jardine). Red-headed Parrot.
A resident, also visitor from other parts of Mt. Meru. Flocks inhabit the forest up to 2800 m usually among *Podocarpus* trees, and descend in June, July and August to lower areas to feed on the fruit of Loliondo (*Olea* spp.).

454. *AGAPORNIS FISCHERI* Reichenow. Fischer's Lovebird.
A regular visitor to *Acacia xanthophloea* groves, numerous outside the Park in Acacia woodland and cultivations. A nest was found in a hole in a dead tree, lined with green grass, on 29.5.71, and in a similar situation on 16.6.71, both on the border of the Park.

457. *CORACIAS GARRULUS* (L.). Roller.
Uncommon, transient Palaearctic migrant, in October-December and March-April to woodland edge.

460. *CORACIAS CAUDATA* (L.). Lilac-breasted Roller.
Uncommon visitor, usually in pairs in March and October. Common outside the Park in *Acacia tortilis* wooded grassland.

463. *EURYSTOMUS GLAUCURUS* (Müller). Broad-billed Roller.
Breeding visitor from August to February. Nests found on 29.9.69, 18.10.69, 9.9.70, 12.11.70 and 22.12.70. Transients are seen from February to April. Habitat: forest edge and woodland, usually at 1500 m, but sometimes up to 2500 m.

465. *CERYLE RUDIS* (Linnaeus). Pied Kingfisher.
A rare visitor to lakes, any month.

466. *MEGACERYLE MAXIMA* (Pallas) Giant Kingfisher.
Vagrant to streams, except on Maji-ya-Chai, where it is regular visitor.

470. *CORYTHORNIS CRISTATA* (Pallas). Malachite Kingfisher.
Uncommon visitor to fresher lakes and swamps.

471. *ISPIDINA PICTA* (Boddaert). Pigmy Kingfisher.
Scarce resident in woodland about Lake Elkekhotoito, occasional to forest edge, but not uncommon along Jamara-Maji-ya-Chai streams.

476. *HALCYON ALBIVENTRIS* (Scopoli). Brown-hooded Kingfisher.
Resident in woodland, forest-edge, often near water, up to 1800 m. Usually breeds in roadside banks, nests found on 25.4.69, 21.3.70, 28.10.70 and seen excavating two nests in May 1971.

477. *HALCYON LEUCOCEPHALA* (Müller). Grey-headed Kingfisher.
Rare transient, once seen in November, and once in June.

479. *HALCYON CHELICUTI* (Stanley). Striped Kingfisher.
A resident in sage-bush and grassland adjacent to woodland, or with plentiful scattered trees. Nest of young found on 24.3.71. Feeding fledgling in November 1967.

481. *MEROPS APIASTER* L. Bee-Eater.
Palaearctic migrant, usually on passage and frequenting sage-bush and acacia woodland.

482. *MEROPS SUPERCILIOSUS PERSICUS* Pallas. Blue-cheeked Bee-Eater.
Infrequent Palaearctic transient, to sage-bush and woodland in late November and early December.

486. *AEROPS ALBICOLLIS* (Vieillot). White-throated Bee-Eater.
A passage of several flocks noted in the Momela section from April 25-30th 1971. All were flying north.

488. *MELITTOPHAGUS PUSILLUS* (Müller). Little Bee-Eater.
A resident with considerable movements. Inhabits sage-bush, grassland, woodland and forest edge below 1700 m. Breeds from June to October, probably other months. Nests found on 20.10.68, 21.6.69, 2.8.69 and 20.10.70.

489. *MELITTOPHAGUS OREOBATES* Sharpe. Cinnamon-chested Bee-Eater.
A resident, also with some movement, inhabiting forest tracks, clearings and edges wherever there are banks for breeding holes, usually above 1500 m. Breeds from October to February.

493. *MELITTOPHAGUS BULLOCKOIDES* (Smith). White-fronted Bee-Eater.
Resident with much post-breeding dispersal. Found anywhere except in forest, but not above 1700 m. Breeds colonially mainly along banks of Ngarenanyuki river in June to July and from October to December.

501. *BYCANISTES BREVIS* Friedmann. Silvery-cheeked Hornbill.
Resident or common visitor in all months. Frequent in parties in forest up to 2600 m. Pairs observed in September and October.

509. *TOCKUS ALBOTERMINATUS* (Buttikorfer). Crowned Hornbill.
Resident in woodland and forest below 1700 m. Seen feeding nestlings on 10.10.70.

518. *UPUPA AFRICANA* Bechstein. South African Hoopoe.
Irregular visitor, uncommon, recorded in February, June, July, September and November. Frequents tree-scattered grassland and sage-bush.

519. *PHOENICULUS PURPUREUS* (Miller). Green Wood-Hoopoe.
Resident, also dry season visitor, found in Acacia woodland and scattered-tree bushland. Nests found on 28.9.70, 5.10.70 and 21.3.71.

526. *RHINOPOMASTUS CYANOMELAS* (Vieillot). Scimitar-Bill.
As previous species but less frequent. Is also occasionally found in Ngurdoto Crater rim forest which is strange as it is a common bird of the dry acacia woodland north of the Park. Nests found on 5.12.69 and 7.3.70.

528. *TYTO ALBA* (Scopoli). Barn Owl.
A few pairs resident. Strictly nocturnal and has only been seen in daylight when disturbed from roosting quarters in an old Hammerkop's nest or thickets on islands in Small Momela lake. In Arusha town breeds in August and September.

529. *TYTO CAPENSIS* (Smith). Grass Owl.
Vagrant to *Cyperus laevigatus* swamp.

532. *ASIO CAPENSIS* (Smith). African Marsh Owl.
Rare visitor to grassland and *Cyperus laevigatus* swamp. Common in Masai plains beyond the Park.

533. *CICCABA WOODFORDII* (Smith). African Wood Owl.
A not uncommon resident of woodland and forest up to 2600 m.

543. *BUBO AFRICANUS* (Temminck). Spotted Eagle Owl.
Scarce resident of woodland, and bush, up to 1680 m.

544. *BUBO LACTEUS* (Temminck). Verreaux's Eagle Owl.
As previous species, but also found in forest edge.

548. *CAPRIMULGUS FRAENATUS* Salvadori. Dusky Nightjar.
Common resident of grassland, thin sage-bush and *Dodonea* scrub below 1680 m. Five nests found, one in each of following months, February, March, September, October, November. All contained two eggs.

556. *CAPRIMULGUS INORNATUS* Heuglin. Plain Nightjar.
Visitor. Recorded in February-March, in grassland and thin sage-bush.

558. *CAPRIMULGUS POLIOCEPHALUS* Rüppell. Abyssinian Nightjar.
Common resident of sage-bush, *Dodonea* scrub, grassland, forest edge and heathzone from 1530 m up to 2700 m. Breeds in October and November, four nests found, all with two eggs.

566. *COLIUS STRIATUS* Gmelin. Speckled Mousebird.
Common resident in sage-bush, woodland and forest edge, occasionally up to 2600 m. Nests found as follows:—16.11.68, 26.2.69, 26.4.70, 12.9.70, 15.9.70 28.9.70, 7.11.70, 23.4.71, 28.4.71, 6.5.71 and 31.5.71.

568. *COLIUS MACROURUS* (L.). Blue-naped Mousebird.
Irregular visitor to the sage-bush, coming from the dry bush north of the Park.

570 *APALODERMA NARINA* (Stephens). Narina's Trogon.
A common resident of forest below 1680 m. Probably breeds in January and February. Sometimes assembles in loose congregations of up to ten birds if prey is locally abundant.

571. *HETEROTROGON VITTATUM* (Shelley). Bar-tailed Trogon.
A resident of forest from 1600 m to 2600 m overlapping with the previous species at lower altitudes.

576. *LYBIUS LEUCOCEPHALUS* (Dephillipi). White-headed Barbet.
A regular visitor or possibly scarce resident, occurring all months to feed on fruit, mainly *Ficus* species. Seen mainly along the lower Ngarenanyuki river where fig-trees are more common.

580. *LYBIUS MELANOPTERUS* (Peters). Brown-breasted Barbet.
A resident and possible visitor frequenting woodland and forest edge to 1680 m. Breeds in January and June. (Beesley 1971a).

584. *TRICHOLAEMA LACRYMOSUM* Cabanis. Spotted-flanked Barbet.
A common resident in woodland and tree-scattered sage-bush. Breeding, nests with eggs or young found as follows: 3.11.68, 10.11.68, 19.2.69, early February 1969, 19.3.69, 5.10.70, 26.5.71 and 8.6.71.

585. *TRICHOLAEMA DIADEMATA* (Heuglin). Red-fronted Barbet.
A vagrant from Masailand.

588. *BUCCANODON LEUCOTIS* (Sundevall). White-eared Barbet.
A common resident of forest and occasionally woodland usually below 1830 m but sometimes up to 2600 m. Nests found on 21.12.68, February 69, 16.10.70 and 9.11.70.

592. *VIRIDIBUCCO LEUCOMYSTAX* (Sharpe). Moustached Green Tinker-bird.
Not uncommon resident of forest canopy, sometimes woodland, usually up to 2000 m rarely to 2500 m. Calls during the rains. Uncharacteristically, it has been noted hawking for flies.

594. *POGONIULUS PUSILLUS* (Dumont). Red-fronted Tinker-bird.
A resident in woodland, especially regenerating *Turrea* and other small-fruited trees in woodland below 1830 m. Calls in October.

605. *INDICATOR INDICATOR* (Sparmann). Black-throated Honey-Guide.
An uncommon visitor to woodland.

606. *INDICATOR MACULATUS* Lesson. Scaly-throated Honey-Guide.
An uncommon resident in forest, woodland and tree scattered bush.

608. *INDICATOR MINOR* Stephens. Lesser Honey-Guide.
As previous species, probably laying in nests of the Spotted-flanked Barbet.

613. *PRODOTISCUS INSIGNIS* (Cassin). Cassin's Honey-Bird.
Possibly only a visitor, to woodland and forest below 1500 m recorded in March and April.

619. *CAMPETHERA NUBICA* (Boddaert). Nubian Woodpecker.
A resident of woodland and forest edge to 1680 m. Nests found on 19.9.68, 28.9.70 and 21.3.71.

622. *CAMPETHERA ABINGONI* (Smith). Golden-tailed Woodpecker.
A scarce resident of woodland and forest up to 2000 m.

623. *DENDROPICOS FUSCESCENS* (Vieillot). Cardinal Woodpecker.
Common resident of woodland and tree-scattered sage-bush, rarely forest edge and clearings below 1680 m.

629. *THRIPIAS NAMAQUUS* (Lichtenstein). Bearded Woodpecker.
Not uncommon resident, habitat as previous species. Found breeding on 10.6.69 and late July 69.

630. *MESOPICOS GOERTAE* (Müller). Grey Woodpecker.
As previous species, but breeding in September and October, nests found on 16.10.68 and 28.9.70

631. *MESOPICOS GRISEOCEPHALUS* (Boddaert). Olive Woodpecker.
A scarce or rarely seen resident of forest above 1800 m.

637. *APUS NIANSAE* (Reichenow). Nyanza or Brown Swift.
A breeding visitor from February to June. Breeds in cliffs from March to May (Beesley 1971a).

639. *APUS MYOPTILUS* (Salvadori). Scarce Swift.
A regular visitor which may breed in Ngurdoto Crater. Noted mainly from February to June, also in November.

640. *APUS MELBA* (L.) Alpine Swift.
Probably a resident, often seen at any time of the year in Meru and Ngurdoto Craters, occasionally over the lakes. Seen feeding at 3660 m on Mt. Meru.

641. *APUS AEQUATORIALIS* (Müller). Mottled Swift.
Probably a resident in Meru Crater, also seen occasionally in Ngurdoto Crater.

643. *APUS AFFINIS* (Gray). Little Swift.
A regular visitor, mainly from November through to July, usually seen in the evening. Nests at lower altitudes beyond the Park.

644. *APUS CAFFER* (Lichtenstein). White-rumped Swift.
A breeding visitor of recent date, occurring from November to June, probably other months too. Bred in May. See section on avifaunal changes, also Beesley 1971a.

645. *APUS HORUS* (Heuglin). Horus Swift.
A breeding visitor or resident. From 1967 to 1969 it was noted breeding in March-June, the birds appearing in January and leaving in August. In 1970 however, they bred at the same time, and then again in November-December. Breeding takes place in the banks of the Ngarenanyuki river. When the Swifts are not occupying the nesting sites, they are used by White-fronted Bee-Eaters. In the latter part of 1970, when the Swifts were using one site, the Bee-Eaters excavated a fresh site.

646. *CYPSIURUS PARVUS* (Lichtenstein). Palm Swift.
A few pairs were resident until 1966 when most of the full-grown *Phoenix* palms along the streams and swamps at the foot of Mt. Meru were destroyed by elephants.
Note. A species of dark Swift inhabits Meru Crater, apparently throughout the year. A specimen for identification has not yet been secured.

650 *SMITHORNIS CAPENSIS* (Smith). African Broad-bill.
A resident of sub-montane forest below 1680 m. Calls in evening from December to February and August to October.

655. *MIRAFRA ALBICAUDA* Reichenow. Northern White-tailed Bush-Lark.
One seen in June 1969 in grassland.

659. *MIRAFRA AFRICANA* A. Smith Rufous-naped Lark.
Common resident of grassland and thin sage-bush. Numbers have increased since some of the sage-bush has been cleared. One nest found, on 31.5.70, containing two eggs.

660. *MIRAFRA RUFOCINNAMOMEA* (Salvadori). Flappet Lark.
One or two pairs are resident in tree-scattered, bushy grassland in the southern end of Ngongongare section at 1370 m, the lowest area of the Park.

666. *PINAROCORYS NIGRICANS* (Sundevall) Dusky Bush-Lark.
One obtained in October 1962.

679. *EREMOPTERIX LEUCOTIS* (Stanley). Chestnut-backed Sparrow-Lark.
One seen in May 1969 in Ngongongare section.

682. *EREMOPTERIX LEUCOPAREIA* (Fischer & Reichenow). Fischer's Sparrow-Lark.
Rare transient in May and November, touching down on roads or grassland. Common in dry areas beyond the Park.

685. *CALANDRELLA RUFESCENS* Vieillot. Rufous Short-toed Lark.
Recorded once in July. Breeds in grass plains just beyond Park boundary.

686. *CALANDRELLA CINEREA* (Gmelin). Red-capped Lark.
Rare visitor to alkaline grassland. A common bird in overgrazed or short-grass country 2 km beyond the Park's northern border.

691. *MOTACILLA AGUIMP* Dumont. African Pied Wagtail.
Resident and visitor. Inhabits the clusters of dwellings and the lakes, found breeding as follows: Early January 1969, 11.4.69 and 8.10.70.

692. *MOTACILLA CLARA* Sharpe. Mountain Wagtail.
A resident on streams, also frequenting wet tracks in the forest during rains.

694. *MOTACILLA CINEREA* Tunstall. Grey Wagtail.
Palaearctic migrant, a few occur on mountain streams from late October to January, occasionally consorting with previous species.

695. *BUDYTES FLAVUS* (Linnaeus). Blue-headed Wagtail.
Palaearctic migrant, irregular to short grass around lakes mainly on return passage. Common with herds of cattle outside the Park.

697. *BUDYTES LUTEUS* (Gmelin). Yellow Wagtail.
As previous species but scarce.

703. *ANTHUS SIMILIS* Jerdon. Long-billed Pipit.
A common resident and visitor in grassland with bushes and trees, also light *Dodonea* bush. Appear to be associated with rocks, often flying to almost perpendicular faces to clamber about or cling to them. Occurs up to 2580 m. Nests found on 18.4.70 and 14.10.70.

706. *ANTHUS NOVAESEELANDIAE* Gmelin. Richard's Pipit.
Regular visitor to short alkaline grassland and nearby roads in the dry season.

708. *ANTHUS TRIVIALIS* (L.). Tree Pipit.
Palaearctic migrant, transient in November-December and February-March. Usually singletons but occasionally flocks of fifty or more on return passage, found in woodland, tree-scattered open country, forest edge up to 2000 m.

713. *ANTHUS CERVINUS* (Pallas). Red-throated Pipit.
Palaearctic migrant, uncommon, to muddy alkaline grassland and edge of *Cyperus* swamp in November and December.

715. *TMETOTHYLACUS TENELLUS* (Cabanis). Golden Pipit.
Vagrant, once recorded mid-March. Occurs in dry bush south and east of the Park. Migrants noted around Arusha in December, January and February.

720. *MACRONYX AURANTIIGULA* Reichenow. Pangani Long-claw.
Resident in bush scattered grassland up to 1800 m. Seen feeding young at nest on 16.7.67, 22.3.69. 10.10.69 and 31.5.71.

729. *TURDOIDES HYPOLEUCA* (Cabanis). Northern Pied Babbler.
Vagrant, one record only, undated specimen.

740. *PSEUDOALCIPPE ABYSSINICUS* (Rüppell). Abyssinian Hill-Babbler.
Resident in sub-montane forest with undergrowth up to 1800 m. On the Arusha side of Mt. Meru however, it is found up to 2300 m.

741-42. *PYCNONOTUS TRICOLOR.* Yellow-vented Bulbul.
Very common resident in any habitat except closed forest. Found up to 2500 m, but usually below 2200 m. At times forms flocks up to 20 in sage-bush, and can be seen in congregations of over 100 in fruiting forest trees. Breeds from January to June and September to November. Nests found as follows: 13.9.68, 15.10.68, 23.10.68, early January 1969, 7.3.70, 27.9.70, 30.9.70, 16.10.70, 23.2.71 6.5.71 (Five) 8.5.71, 9.5.71 12.5.71, 13.5.71, (Two) 21.5.71 and 7.6.71.

758. *PHYLLASTREPHUS FISCHERI* (Reichenow). Fischer's Greenbul.
Not uncommon resident of forest with undergrowth up to 1800 m, but goes considerably higher on the Arusha side of Mt. Meru.

759. *PHYLLASTREPHUS CERVINIVENTRIS* (Shelley). Grey-olive Greenbul.
Visitor to stream-side thickets at southern and lowest end of the Park in the Ngongongare section at 1370 m. Commoner outside the Park at lower altitudes.

766. *ARIZELOCICHLA NIGRICEPS* (Shelley). Mountain Greenbul.
Common resident of forest from 1520 m to 2800 m. Breeds in August, September and November, nests being found on 18.9.68 and 9.11.69.

767. *ARIZELOCICHLA MILANJENSIS* (Shelley). Stripe-cheeked Greenbul.
Common resident of sub-montane forest, seldom found above 1850 m. Uses similar habitat to previous species but generally at lower altitudes. Seen carrying nesting material on 3.6.71.

775. *EURILLAS VIRENS* (Cassin). Little Greenbul.
Scarce visitor from July to September from lower areas beyond the Park. Inhabits forest with undergrowth below 1680 m.

778. *MUSCICAPA STRIATA* (Pallas). Spotted Flycatcher.
Common Palaearctic migrant preferring the low, regenerating *Acacia xanthophloea* along lake shores, also inhabits mature woodlands.

781. *ALSEONAX ADUSTUS* (Boie). Dusky Flycatcher.
Common resident of forest to 2700 m. Many descend during the cold season (June-Septeber) to the Acacia woodland and scrub around lake shores. Breeds in January to March and October, November and December. Nests found on 30.1.65, 23.11.67, 17.11.68, 15.3.69, 12.12.69 and 17.10.70.

788. *PARISOMA PLUMBEUM* (Hartlaub). Grey Tit-Flycatcher.
A visitor to canopy of *Acacia xanthophloea* trees around lake Elkekhotoito.

796. *DIOPTRORNIS FISCHERI* Reichenow. White-eyed Slaty Flycatcher.
A common resident of forest edge, glades and woodland, usually up to 2700 m, often descending in cold months to lower altitudes. Breeds from February to May and September to November. Nests found in March 64, March 67, 18.9.68, 17.11.68, 12.10.69, 14.10.70, 10.5.71, fledglings on 14.4.69.

805. *CHLOROPETA NATALENSIS* Smith. Yellow Flycatcher.
A fairly common resident in sage-bush, regenerating acacia scrub and forest edge below 1830 m. Nests found as follows, 4 on 5.5.71 and one on 29.5.71. It also breeds, probably in December and January.

806. *CHLOROPETA SIMILIS* Richmond. Mountain Yellow Flycatcher.
A resident, but seldom seen, in undergrowth of forest and its edges, from 1830 m upwards. Display seen in early December.

815. *BATIS CAPENSIS* (L.) Puff-back Flycatcher.
A resident of lower storeys of sub-montane forest up to 1700 m, occasionally seen up to 2000 m.

817. *BATIS MOLITOR* (Hahn & Küster). Chin-Spot Puff-back Flycatcher.
Common resident of trees and tall bush, but not in forest, up to 1700 m. Nests found on 16.11.68, 26.2.69, 18.10.70 and 22.10.70.

823. *PLATYSTEIRA PELTATA* Sundevall. Black-throated Wattle-eye.
A scarce resident in sub-montane forest, usually riverine, below 1830 m. Common in gallery forest south of the Park. Seen feeding fledglings in August and November.

828. *TROCHOCERCUS CYANOMELAS* (Vieillot). Crested Flycatcher.
An uncommon resident in forest with undergrowth below 1700 m. Frequents lower storeys.

832. *TCHITREA VIRIDIS* (Müller). Paradise Flycatcher.
A common resident of forest and edges, woodland and riverine strips below 2000 m. Breeds from October to April. Nests found in December 1968, and on 26.2.69, 20.4.70, 18.10.70 and 22.10.70.

841. *TURDUS OLIVACEUS* (L.). Olive Thrush.
A common resident of forest and tall heath from 1500 m to limit of tree growth. Sometimes seen in parties up to ten feeding on fruit. Nests found on 7.4.69 and 10.11.70. Fledglings on 2.10.69.

844. *GEOKICHLA GURNEYI* (Hartlaub). Orange Ground Thrush.
A seldom seen resident of forest, so far unrecorded above 2000 m. On the southern side of Mt. Meru it has been seen in bamboos at 2400 m.

850. *MONTICOLA SAXATILIS* (L.) Rock Thrush.
A Palaearctic migrant, usually seen in November and March in Acacia woodland.

854. *OENANTHE OENANTHE* (L.). Wheatear.
A scarce transient from the Palaearctic, occurring in grassland in October-November and March.

865. *OENANTHE LUGUBRIS* (Rüppell). Abyssinian Black Wheatear.
One seen in April 1969. It is common in eroded grassland and dry torrent courses in drier areas around Mt. Meru.

868. *OENANTHE PILEATA* (Gmelin). Capped Wheatear.
A rare transient in May and September, being common in short grassland plains beyond the Park.

882. *SAXICOLA TORQUATA* (L.) Stonechat.
A common resident, occurring from 1400 m to over 3000 m. Usually inhabits bushy areas, with or without grassland and trees, also long-grass swamp, *Dodonea* woodland and the heath-zone. Breeds from September to March, nest being found on 5.9.69, 8.12.69, 22.10.70, 4.12.70. 10.1.71 and 11.3.71.

883. *SAXICOLA RUBETRA* (L.) Whinchat.
One record only, January 1966.

885. *COSSYPHA SEMIRUFA* (Rüppell). Rüppell's Robin Chat.
A common resident of forest and damp, well-grown sage-bush and thicket up to 1800 m. Nests found in March and April. It is a wonderful mimic, imitating Crowned Hawk-Eagle, Green Sandpiper, Red-chested, Didric, and especially Emerald Cuckoos, Bulbul, Black-heaed Oriole, and human whistles.

893. *COSSYPHA CAFFRA* (L.) Robin Chat.
A not uncommon resident of forest-edge shrubbery, glades and heath zone from 1700-3500 m.

910. *ERYTHROPYGIA ZAMBESIANA* Sharpe. Red-backed Scrub-Robin.
A resident of sage-bush and regenerating Acacia scrub in dryer areas.

915. *POGONOCICHLA STELLATA* (Vieillot). White-starred Bush-Robin.
Common resident of forest undergrowth up to 2500 m, breeding from November through to June, Nest found on 8.12.69. and 20.4.70, newly fledged young on 8.11.69 and in mid-June 1970.

920. *IRANIA GUTTURALIS* (Guerin.) White-throated Robin.
24.3.71, one female; 26.3.71; one male, in acacia scrub and sage-bush.

922. *LUSCINIA LUSCINIA* (L.) Sprosser.
Rare Palaearctic migrant to secondary vegetation and thickets, in November and December.

924. *SYLVIA COMMUNIS* Latham. Whitethroat.
A Palaearctic migrant, mainly transient in November, but occasionally seen from October to December. Inhabits bush.

925. *SYLVIA BORIN* (Boddaert). Garden Warbler.
Rare Palaearctic migrant frequenting thick bush.

926. *SYLVIA ATRICAPILLA* (L.) Blackcap.
Palaearctic migrant, sometimes abundant. Inhabits thickets and dense shrubbery in woodland and forest edge. Occasionally found in heathland up to 2450 m.

936. *HIPPOLAIS OLIVETORUM* (Strickland.) Olive-tree Warbler.
Rare Palaearctic migrant seen in trees on return migration in mid-March.

938. *HIPPOLAIS PALLIDA* (Hemprich & Ehrenberg). Olivaceous Warbler.
Occasional Palaearctic migrant, seen in woodland canopy from October to March.

940. *LOCUSTELLA FLUVIATILIS* (Wolf). River Warbler.
Palaearctic migrant. One found dead in early April. (Beesley 1971a).

947. *ACROCEPHALUS SCHOENOBAENUS* (L.). Sedge Warbler.
Rare Palaearctic migrant seen in lakeside vegetation on return passage in mid-March.

948. *BRADYPTERUS BABOECALA* (Vieillot). Little Rush Warbler.
Resident in tall-grass swamps. Singing and courtship noted in November and December.

952. *SATHROCERCUS CINNAMOMEUS* (Rüppell). Cinnamon Bracken Warbler.
Common resident of shrubbery and undergrowth of forest, glades and edges, also heath zone, from 1500 to 2900 m.

953. *SATHROCERCUS MARIAE* (Madarasz). Evergreen Forest Warbler.
As previous species, but lives more inside the forest.

955. *CALAMOCICHLA RUFESCENS.* (Sharpe & Bouvier) Rufous Swamp Warbler.
This bird was previously named *C. gracilirostris*, Greater Swamp Warbler. For nomenclature see Mackworth-Praed & Grant (1960 2nd ed.). Birds of Eastern and North Eastern Africa, Vol. II p. 519.
A resident and visitor to long grass swamp. Ngurdoto Crater swamp is a reservoir of this species, which in years of good rainfall spreads to other areas.

959. *PHYLLOSCOPUS TROCHILUS* (L.) Willow Warbler.
A numerous Palaearctic migrant, the main streams of migration passing in late October and late March to mid-April. Sings well in October, March and April. Found in woodland, tall bush and forest edge, sometimes up to 2600 m on passage.

964. *SEICERCUS UMBROVIRENS* (Rüppell). Brown Woodland Warbler.
Common resident of forest at all altitudes. Found breeding once in December.

969. *SCHOENICOLA BREVIROSTRIS* (Sundevall). Fan-tailed Warbler.
Sporadic visitor to tussock grassland and short sage-bush. Not uncommon outside the Park along the northern base of Mt. Meru. Probably resident in the lower Ngongongare sector.

970. *APALIS THORACICA* (Shaw & Nodder). Bar-throated Apalis.
A scarce resident of the lower storeys of forest edge and glades from 1700-2000 m.

975. *APALIS MELANOCEPHALA* (Fischer & Reichenow). Black-headed Apalis.
Uncommon resident of lower storeys of forest with undergrowth below 1800 m.

979. *APALIS FLAVIDA* (Fischer & Reichenow). Black-breasted Apalis.
A common resident of *Acacia* and other woodland, and tall sage bush. Consorts with *Batis molitor*, *Sylvietta whytii* and *Phyllolais pulchella* in roving parties. Nests found as follows:- 23.9.70, 28.9.80, (2 nests) 1.5.71, 4.5.71, 5.5.71 (2 nests), 16.5.71 and 26.5.71. All had 2 eggs.

995. *PHYLLOLAIS PULCHELLA* (Cretzschmar). Buff-bellied Warbler.
A resident of *Acacia xanthophloea* woodland only, but inhabits *Acacia tortilis* outside the Park. Nest-building seen in early November.

997. *SYLVIETTA WHYTII* Shelley. Red-faced Crombec.
A resident of sage-bush with trees and woodland, found breeding on 28.10.69. 13.10.70, 19.10.70. 4.11.70 and 17.12.70.

1011. *CAMAROPTERA BREVICAUDATA* (Cretzschmar). Grey-backed Camaroptera.
A resident of undergrowth and low bush in woodland and forest-edge up to 1800 m. Found breeding on 14.4.69. 8.5.70 and 12.6.71.

1016. *CISTICOLA JUNCIDIS* (Rafinesque). Zitting Cisticola.
A dry season visitor to grassland, occasionally during the rains. Common in grass plains beyond the Park.

1018. *CISTICOLA ARIDULA* Witherby. Desert Cisticola.
As previous species, but also frequents thin sage-bush.

1024. *CISTICOLA CHINIANA* (A. Smith). Rattling Cisticola.
A resident and visitor, frequenting sage-bush and regenerating *Acacia* scrub up to 4 m tall. A recently established resident, it is common in the dry bush beyond the Park, and is a dry season visitor. Found breeding on 25.3.70 and 9.4.70.

1026. *CISTICOLA WOOSNAMI* O. Grant. Trilling Cisticola.
Common resident in woodland, bush with scattered trees, and forest edge up to 1700 m. Nests found on 2.4.70, 4.4.70 and 3.5.71.

1030. *CISTICOLA HUNTERI* Shelley. Hunter's Cisticola.
A resident of shrubby grassland and heath on Mt. Meru from 1830 to 3700 m.

1031. *CISTICOLA CANTANS* (Heuglin). Singing Cisticola.
Common resident mainly of sage-bush also inhabits forest edge and secondary growth up to 1650 m. Does not occupy such dry country as *C. chiniana*. Nests found on 10.3.69, 11.2.70, 3.3.70, 10.7.70, 8.5.71 (two), 22.5.71, 25.5.71 and 26.5.71 (two).

1032. *CISTICOLA ERYTHROPS* Hartlaub. Red-faced Cisticola.
Uncommon resident of bush and long grass around fresher swamps and streams in the Seneto and Ngongongare sections. Breeds in November and December, one nest found on 16.11.68.

1033. *CISTICOLA GALACTOTES* (Temminck). Winding Cisticola.
Common resident of grassland, sage-bush, and well-grown *Cyperus laevigatus* swamps, never far from water. Breeds in May-July and November-January. Nests found on 18.11.68, 26.12.68, May 1969, 8.7.69, and 7.5.70.

1035. *CISTICOLA ROBUSTA* (Rüppell). Stout Cisticola.
A very local resident in the Park, found only in derived grassland (mainly *Eleusine jaegeri*) on the lower slopes of Mt. Meru at 1600-2100 m.

1036. *CISTICOLA NATALENSIS* (Smith). Croaking Cisticola.
A resident and visitor, inhabiting sage-bush. Outside the Park it occurs commonly in the sage-bush to the north and on the northern slopes of Mt. Meru.

1037. *CISTICOLA BRACHYPTERA* Sharpe. Siffling Cisticola.
Common resident in tree-scattered grassland and sage-bush, feeding mainly on the ground. Breeds in February and March. Nests found on 1.2.69 and 21.3.70.

1045. *PRINIA SUBFLAVA* (Gmelin). Tawny-flanked Prinia.
A common resident of the sage-bush and busy woodland, which has been found nesting on 20.11.68, 14.2.70, 14.4.70, 28.4.71, 2.5.71, 4.5.71, 6.5.71, 15.5.71, 17.5.71, 20.5.71 and 26.5.71. Mostly with 3 or 4 eggs.

1051. *MELOCICHLA MENTALIS* (Fraser). Moustache Warbler.
An abundant resident of the sage-bush, found breeding so far on 24.9.68. 28.9.69, 23.4.71 and 17.5.71.

1054. *HIRUNDO RUSTICA* L. European Swallow.
A Palaearctic migrant, numerous on passage in October-November, some remaining until April. Found mainly over the lakes and environs, especially feeding on Chironomids as they emerge in great columns during the late afternoon. They are joined by other Hirundines and Swifts.

1061. *HIRUNDO SMITHII* Leach. Wire-tailed Swallow.
Several pairs are resident, having increased in numbers in the last few years with the increase in buildings. Found breeding from February to October, and probably breeds throughout the year. One pair raised four broods in one year. Nests with eggs found on 19.8.68, 10.10.68, 5.2.69, 10.5.69, 3.9.69, 25.5.70, 1.10.70, 10.10.70, 20.5.71, and 28.6.71.

1062. *HIRUNDO DAURICA* L. Red-rumped Swallow.
An occasional visitor, usually seen over the lakes. So far recorded in February and March, and June to September.

1063. *HIRUNDO SENEGALENSIS* L. Mosque Swallow.
An increasing resident, breeding in buildings, often taking over the nest of *H. smithii*. Eggs laid probably any month, but recorded in April, May, June and December. The young roost with the parents in the nest for two months after fledging.

1065. *HIRUNDO ABYSSINICA* Guerin. Striped Swallow.
A resident, nesting under the Maji-ya-Chai bridge in the Ngongongare section. In 1968 a spate swept the nests away and those birds have not yet returned. It is also a visitor, appearing over the lakes in flocks in May to August and November and December. Recently found breeding in January on cliffs along the Maji-ya-Chai.

1068. *RIPARIA RIPARIA* (L.) European Sand Martin.
A rare Palaearctic transient in October and March, seen over lakes.

1069. *RIPARIA PALUDICOLA* (Vieillot). African Sand Martin.
A resident and visitor, the latter occurring from July to October and January to March. Residents breed from March to July. The habitat is around lakes and the Ngarenanyuki river.

1070. *RIPARIA CINCTA* (Boddaert). Banded Martin.
An irregular visitor, small parties occurring in grassland and sage-bush from the end of February to early April and from May to June.

1073. *PTYONOPROGNE FULIGULA* (Lichtenstein). African Rock Martin.
A resident, inhabiting the environs of cliffs and buildings, where they breed probably any month but so far recorded during February to May and in October.

1074. *DELICHON URBICA* (L.) House Martin.
An infrequent Palaearctic migrant, seen in October to December and March to April, usually over lakes.

1075. *PSALIDOPROCNE HOLOMELAENA* (Sundevall). Black Roughwing Swallow.
A common resident in forest edges, glades and roads up to 2700 m, but feeds a great deal over the lakes at 1460 m especially when clouds are low. Found breeding during every month.

1081. *CAMPEPHAGA SULPHURATA* (Lichtenstein). Black Cuckoo-Shrike.
A not uncommon resident in woodland and forest edge also secondary growth such as *Croton* and *Dodonea*. Courtship observed from September to November and March to April. A nest of young found on 10.5.71.

1084. *CAMPEPHAGA QUISCALINA* Finsch. Purple-throated Cuckoo-Shrike.
A male and female believed to be of this species observed in forest at 1650 m, but the record needs to be substantiated by a specimen.

1085. *CORACINA PECTORALIS* (Jardine & Selby). White-breasted Cuckoo-Shrike.
One record only in November 1969, a female seen in Acacia woodland.

1088. *DICRURUS ADSIMILIS* (Bechstein). Drongo.
An infrequent visitor seen in March, June, September and December in woodland. A common bird in coffee-plantations and *Acacia* woodland outside the Park.

1090. *PRIONOPS PLUMATA* (Shaw). Straight-crested Helmet-Shrike.
A visitor from June to September, frequenting the canopy of submontane forest and *Dodonea* woodland.

1095. *SIGMODUS RETZII* (Wahlberg). Retz's Red-billed Shrike.
A resident in submontane forest to 1680 m. Found in nomadic flocks which are constantly on the move through the canopy.

1098. *NILAUS AFER* (Latham). Northern Brubru Shrike.
A scarce resident of Acacia woodland, found breeding once in September. A common bird in *Acacia ortilis* woodland north of the Park.

1103. *LANIUS MINOR* Gmelin. Lesser Grey Shrike.
A rare Palaearctic migrant to bushy areas in March and April.

1104. *LANIUS COLLARIS* L. Fiscal Shrike.
A common resident of sage-bush, bush-scattered grassland and regenerating *Acacia xanthophloea* stands. Normally it is found below 1680 m but one was seen in the heath zone on Mt. Meru at 2580 m in July 1969, so the bird is presumably a wanderer. Probably breeds throughout the year. Nests found on 24.9.68, 23.10.68, 8.1.69, 26.2.69. 13.10.70, 1.12.70, 26.3.71, 20.4.71 and 12.6.71.

1112. *LANIUS COLLURIO* L. Red-backed Shrike.
A Palaearctic migrant to the regenerating *Acacia xanthophloea* fringing the lakeshores, a few being seen from late October to late April.

1114. *LANIUS CRISTATUS* L. Red-tailed Shrike.
Status and habitat as previous species.

1125. *LANIARIUS AETHIOPICUS* (Gmelin). Tropical Boubou.
A common resident of woodland, forest-edge and secondary growth, also has established itself in the sage-bush and heath-zone. Breeds from December to May. Nests found on 26.2.69, 10.1.70 and 10.5.71.

1128. *DRYOSCOPUS CUBLA* (Shaw). Black-backed Puff-back Shrike.
A common resident in sub-montane forest, woodland, and occasionally bushes, not found above 2000 m.

1133. *TCHAGRA SENEGALA* (L.). Black-headed Bush-Shrike.
A scarce resident, a few pairs being found in a variety of habitats, in which the more numerous *Tchagra australis* is found i.e. *Acacia* and *Dodonea* woodland, sage-bush, both in damp and dry situations. One nest found in dry sage- bush in December, another in *Dodonea* woodland in June, both contained two eggs.

1134. *TCHAGRA AUSTRALIS* (Smith). Brown-headed Bush-Shrike.
As previous species but more abundant. Found breeding on 21.12.68, 14.1.69, 19.5.71 and 13.6.71.

1138. *CHLOROPHONEUS SULFUREOPECTUS* (Lesson). Sulphur-breasted Bush-Shrike.
Resident, mainly in canopy of *Acacia* or other woodland, also in well-grown *Dodonea* woodland. Sings from September to December.

1140. *CHLOROPHONEUS NIGRIFRONS* (Reichenow). Black-fronted Bush-Shrike.
A resident of sub-montane forest up to 1830 m.

1159. *PARUS FRINGILLINUS* Fischer & Reichenow. Red-throated Tit.
A resident augmented by visitors in the dry season. Inhabits canopy of *Acacia xanthophloea* groves. Constantly on the move.

1164. *ORIOLUS ORIOLUS* (L.) Golden Oriole.
A Palaearctic migrant, not seen every year. In 1969 parties of mixed sexes with juveniles numbering up to twelve passed through from early October to late November. A few birds were seen on return passage in March. They fed in the canopy of *Croton macrostachyus* trees on berries and caterpillars. A few *O. larvatus* were seen with them.

1165. *ORIOLUS AURATUS* Vieillot. African Golden Oriole.
One male obtained at Ngurdoto Gate in light forest in June 1970.

1167. *ORIOLUS LARVATUS* Lichtenstein. Black-headed Oriole.
Common resident of woodland and forest up to 1700 m. Found breeding on 4.11.68 and 5.6.71.

1172. *CORVUS ALBUS* Müller. Pied Crow.
A rare visitor, which is common in and around Arusha township.

1175. *CORVUS ALBICOLLIS* (Latham). White-necked Raven.
A few pairs are resident, mainly around Ngurdoto Crater and Mt. Meru. Attracted to picnic parties and camp-sites, and becoming tame.

1182. *CREATOPHORA CINEREA* (Menschen). Wattled Starling.
A vagrant in April and May from the dryer country north of Ngarenanyuki village.

1184. *CINNYRICINCLUS LEUCOGASTER* (Boddaert). Violet-backed Starling.
An irregular visitor in varying numbers, sometimes many hundreds. Has been seen in all months, but mainly visits the fruiting Loliondo (*Olea* spp.) trees in July to late September, and the *Croton* trees in October and November.

1185. *PHOLIA SHARPEI* (Jackson). Sharpe's Starling.
A resident and also a visitor in large flocks. Haunts the canopy of fruiting trees, especially Loliondo in June and July, when the birds are accompanied by juveniles.

1186. *PHOLIA FEMORALIS* (Richmond). Abbott's Starling.
Only two records so far, one bird in Meru forest at 2500 m in October, and several with a party of *P. sharpei* in Ngurdoto forest on 30.5.71.

1201. *ONYCHOGNATHUS WALLERI* (Shelley). Waller's Chestnut-wing Starling.
A resident of the canopy of forest trees, especially *Podocarpus* and *Juniperus* on Mt. Meru from 1680 to 2740 m. On Ngurdoto Crater inhabits *Olea* and *Cassipourea* down to 1450 m. A nest found fairly high in a forest tree on Mt. Meru at 2300 m on 15.10.70.

1203. *ONYCHOGNATHUS MORIO* (L.) Redwing Starling.
A resident about buildings, cliffs and waterfalls. Congregates into large flocks from May to July. Recorded nesting in February-March and October-December. Noted hammering snails on stones. or concrete in the manner of the Song Thrush *Turdus philomelos* L.

1210. *STILBOSPAR KENRICKI* (Shelley). Kenrick's Starling.
A resident and visitor. Found in the canopy of fruiting forest trees from 1370-1830 m, occasionally to 2100 m. Found breeding on 18.9.68, 25.10.68, 3.4.69, 17.9.69 and two nests on 21.5.71. When in feeding flocks, often congregates with Violet-backed and Sharpe's Starlings.

1217. *BUPHAGUS AFRICANUS* (L.) Yellow-billed Oxpecker.
A resident, always with large mammals. Found up to 2600 m.

1218. *BUPHAGUS ERYTHRORHYNCHUS* (Stanley). Red-billed Oxpecker.
Status as previous species, but more abundant. Have been seen feeding or roosting on a Giraffe three hours after dark. (Beesley 1971a). Breeds mainly from October to December, also February and March. Nests found on 3.11.70, 5.11.70, 6.2.71 and 9.3.71.

1220. *ZOSTEROPS SENEGALENSIS* Bonaparte. Yellow White-eye.
A rare visitor to Acacia woodland in June-September, and has been seen associating with *Z. eurycricotus*. A common bird of dry bush/woodland in Masailand.

1222. *ZOSTEROPS EURYCRICOTUS* Fischer & Reichenow. Broad-ringed White-eye.
An abundant resident, mainly of forest and closed woodland at all levels up to 3000 m. Also occurs in the heath-zone and scattered *Hagenia* trees, and rarely in *Acacia* woodland and scrub around the lakes. Found breeding on 12.12.69 and 30.5.71.

1227. *NECTARINIA FAMOSA* (L.) Malachite Sunbird.
Probably only a visitor. It is a very mobile species, following the flowering of trees and shrubs. From May to mid-September it is found in the sage-bush, but numbers vary greatly. Occasionally found in heath-zone up to 3000 m.

1229. *NECTARINIA TACAZZE* (Stanley). Tacazze Sunbird.
A resident, not uncommon, of forest edge, glades and heath-zone, from 2100 m to the higher limits of shrubby growth. Breeds at 2100 to 3000 m from December to February, which are the warmest months on Mt. Meru. Nests found on 5.2.67, 23.12.69, 27.12.70 and 11.2.71.

1230. *NECTARINIA KILIMENSIS* Shelley. Bronze Sunbird.
A resident and visitor. The visitors, as of the previous species, follow the flowers, but after poor rains when flowering is sparse, few birds appear. Inhabits sage-bush, woodland, scattered trees, and was once seen in heath-zone in December. Prone to attack its reflection in windows, and a male nesting near the writer's house entered the bedroom window every morning to sing at its image in the mirror. Found breeding on 18.11.68, 27.4.69, 10.10.70, 16.3.71 and 12.6.71.

1233. *NECTARINIA PULCHELLA* (L.) Beautiful Sunbird.
A visitor to the Ngongongare section in the late dry season. Comes from the drier acacia steppe.

1235. *DREPANORHYNCHUS REICHENOWI* Fischer. Golden-winged Sunbird.
Status uncertain, another nomadic species of sporadic appearance at all levels, congregating to the flowers of *Crotalaria agatifolia* on Mt. Meru. Rarely seen in the sage-bush at 1460 m. Commoner on the southern side of Mt. Meru, and in October it appears in parties with *N. kilimensis* and *N. famosa* in the flowering Jacaranda trees in Arusha town.

1251. *CINNYRIS VENUSTUS* (Shaw & Nodder). Variable Sunbird.
An abundant resident having local migrations, it inhabits sage-bush and secondary woodland. Breeds from May to August when sage-bush components are in flower. Nests found on 29.6.69, 28.7.68 and 8.5.70

1254. *CINNYRIS MEDIOCRIS* Shelley. Eastern Double-collared Sunbird.
Common resident of forest-edge and heath-zone on Mt. Meru from 1800 m upwards. Found breeding on 26.10.68, 20.9.69 and 3.11.69.

1261. *CHALCOMITRA AMETHYSTINA* (Shaw). Amethyst Sunbird.
A resident, apparently more common in some years than others, inhabiting forest-edge and woodland below 1800 m, also visiting the sage-bush when in flower. Nests found as follows: 12.4.70, 10.10.70, 22.10.70 and 4.11.70.

1263. *CHALCOMITRA SENEGALENSIS* (L.) Scarlet-chested Sunbird.
A resident, but locally migratory, of light woodland, also visiting the sage-bush. Recorded breeding every month except the colder season of July-August. Will hang the nest from the ends of roof spars, electric-light bulbs or tips of branches. Nests found on 13.9.68, 12.10.68, 6.11.68, 8.1.69, 6.2.69, 4.3.70, 27.5.70, 12.10.70, 14.12.70, 12.4.71 and 23.5.71.

1269. *CYANOMITRA OLIVACEA* (Smith). Olive Sunbird.
A resident of forest mainly its edges and clearings and dense woodland, usually below 2100 m. Found breeding on 15.2.69 and 4.3.70.

1271. *ANTHREPTES COLLARIS* (Viellot). Collared Sunbird.
A resident of similar habitat to previous species, found breeding on 15.3.69, 31.3.69, 9.1.70, 30.4.71 and 17.5.71 N.P.

1300. *PASSER GRISEUS* (Vieillot). Grey-headed Sparrow.
An uncommon visitor, straying in from Momela Game Lodge and clusters of dwellings in shambas outside the Park boundary where it breeds.

1306. *SORELLA EMINIBEY* Hartlaub. Chestnut Sparrow.
Recorded once, in breeding plumage, on 1.5.70.

1314. *PLOCEUS SPEKEI* (Heuglin). Speke's Weaver.
A resident and/or visitor that has been recorded in every month, but is often absent. Haunts the trees about the old Park H.Q. near Lake Kusare. Recorded breeding in March - April.

1319. *PLOCEUS INTERMEDIUS* Rüppell. Masked Weaver.
A sporadic visitor, usually in the dry season to the regenerating *Acacia* trees lining the lake-shores, but not every year. In March and April 1969, a few bred in trees on the islands in Great Momela Lake and at the old H.Q., and in May 1971 a colony built on an island in the lake.

1326. *PLOCEUS JACKSONI* Shelley. Golden-backed Weaver.
A visitor to the bush around Momela lakes from August to October.

1327. *PLOCEUS RUBIGINOSUS* Rüppell. Chestnut Weaver.
As previous species. These birds are common in farmlands beyond the Park.

1333. *PLOCEUS CASTANEICEPS* (Sharpe). Taveta Golden Weaver.
A resident and visitor, frequenting swamps and bush in damp situations. Breeds in swamps whenever conditions suitable, especially where reed-mace *Typha* is abundant. Egg-laying noted in November-December and March-May.

1337. *HYPHANTURGUS OCULARIS* (A. Smith). Spectacled Weaver.
A resident, mainly of lakeside trees and bushes, and nearby thicket and woodland, also forest edge, strips and clearings up to 2000 m. Noted breeding in September-November and April-May. Some nests appear to be built for roosting purposes.

1348. *OTHYPHANTES REICHENOWI* (Fischer). Reichenow's Weaver.
A resident of secondary woodland and tree-scattered sage-bush, occasionally forest-edge, rarely seen above 1800 m. Seen building nests in any month. One pair will build up to seven nests, occupying but one. Only one record of eggs so far, one egg on 14.6.71.

1358. *AMBLYOSPIZA ALBIFRONS* (Vigors). Grosbeak Weaver.
A breeding visitor to long-grass swamps, dispersing after breeding to surrounding forest edges. Nests found in April and May.

1359. *ANAPLECTES MELANOTIS* (Lafresnaye). Red-headed Weaver.
An uncommon visitor to most of the Park, but possibly resident in the Ngongongare section. Inhabits forest edge and woodland at low altitudes.

1360. *QUELEA QUELEA* (L.) Red-billed Quelea.
Rare visitor to grassland and sage-bush in May-June and November. Just drops in for a day as there is little suitable feed.

1362. *QUELEA CARDINALIS* (Hartlaub). Cardinal Quelea.
A vagrant, only once recorded.

1367. *EUPLECTES CAPENSIS* (L.). Yellow Bishop.
A resident of sage-bush and tussock grassland, breeding in the rains of April and May. It has been noted that breeding plumage begins to be assumed in October, and in some birds is retained until June or even August. Nests found on 7.4.69 and 10.5.71.

1376. *COLIUSPASSER LATICAUDA* (Lichtenstein). Red-naped Widow-Bird.
A resident of sage-bush and tussock grassland, from 1500-2000 m. Breeds in March-May, breeding plumage being attained in October-December. Nests found on 5.3.69 and 8.5.71.

1379. *SPERMESTES CUCULLATUS* Swainson. Bronze Mannikin. A mobile resident and probably a visitor. Inhabits sage-bush, rough grassland, swamp-edges and scrubby woodland. Probably breeds in any month, but eggs recorded in January, February, June, December.

1381. *SPERMESTES NIGRICEPS* Cassin. Rufous-backed Mannikin.
A resident, constantly on the move, in woodland, tall-grass swamps in forest, forest-edge and clearings up to 2000 m. Found breeding from February to June. Nests as follows: 26.2.69, 14.3.71, 8.5.71 and 7.6.71.

1383. *EODICE MALABARICA* (L.) Silver-bill.
An uncommon visitor to the sage-bush in the Ngongongare section.

1384. *ODONTOSPIZA CANICEPS* (Reichenow). Grey-headed Silver-bill.
A transient through the sage-bush and secondary scrub, mainly along streams, during the dry season.

1386. *NIGRITA CANICAPILLA* (Strickland). Grey-headed Negro-Finch.
A resident of forest, found breeding from September to November.

1398. *CRYPTOSPIZA REICHENOWI* (Hartlaub). Red faced Crimson-wing.

1399. *CRYPTOSPIZA SALVADORII* (Reichenow). Abyssinian Crimson-wing.
These two species are treated together, and although none has yet been obtained, I believe their identification is correct. They inhabit the forest and forest edge on Mt. Meru up to 2500 m, no difference so far noted in their habitat.

1403. *ORTYGOSPIZA ATRICOLLIS* (Vieillot). Quail-Finch.
An uncommon visitor to grassland and open lake-shores, coming from the grass plains north of the Park.

1407. *MANDINGOA NITIDULA* (Hartlaub). Green-backed Twinspot.
A resident of forest with heavy undergrowth at the base of Mt. Meru (1500-1670 m). Difficult to see, but comes to bathing places on streams at mid-day.

1411. *LAGONOSTICTA RUBRICATA* (Lichtenstein). African Fire-Finch.
A resident and visitor, being more evident in November-December and March-June, the short and long rains. Inhabits bush, from sage-bush at 1400 m to heath-zone at 2500 m. A nest with one egg found on 17.6.71.

1413. *LAGONOSTICTA SENEGALA* (L.) Red-billed Fire-Finch.
A scarce resident and visitor, a passage noted in May-June. Frequents sage-bush and secondary woodland with grassland. A common bird in cultivations outside the Park.

1417. *COCCOPYGIA MELANOTIS* (Temminck). Yellow-bellied Waxbill.
A resident of grassland, heath, forest edges and clearings from 1700-2500 m. A nest found on 24.5.71 at 1500 m, a lower altitude than I have ever seen the bird before, and another on 24.6.71.

1418. *ESTRILDA ASTRILD* (L.) Waxbill.
A resident augmented by visitors in March-May and November-December. Found in secondary bush, grassland and swamp, it is a mobile bird, roaming the country for grass-seeds and is especially fond of well-grown *Cyperus laevigatus* seeds. Breeds from February to June. Nests found on 6.2.69, 15.3.69, 9.4.69 (two), 14.6.69, 24.4.71, 27.4.71 (two), 10.5.71, 15.5.71, 10.6.71, 14.6.71, and 24.6.71.

1420. *ESTRILDA RHODOPYGA* (Sundevall). Crimson-rumped Waxbill.
A dry season visitor, to sage-bush and lake side vegetation.

1421. *ESTRILDA SUBFLAVA* (Vieillot). Zebra Waxbill.
A rare visitor to lake side grasslands, noted only in April and May.

1427. *ESTRILDA ERYTHRONOTOS* (Vieillot). Black-cheeked Waxbill.
An infrequent visitor in June-July and November-December to rocky sage-bush. A bird of the drier, rocky thorn-scrub to the north.

1431. *URAEGINTHUS BENGALUS* (L.). Red-cheeked Cordon-Bleu.
A resident of sage-bush in the lower Ngongongare sector.

1432. *URAEGINTHUS CYANOCEPHALUS* (Richmond). Blue-capped Cordon-Bleu.
A visitor noted only in recent times. Recorded first in January 1969, it was then seen frequently in May, July, August and November, then not again in 1970. Usually seen in the sage-bush, a pair were however seen in a glade of *Eleusine jaegeri* grassland at 1980 m on Mt. Meru in May. Normally this is a bird of the dry bush of Masailand.

1433. *GRANATINA IANTHINOGASTER* (Reichenow). Purple Grenadier.
As the previous species, only recorded recently in the Park, on May 20th, 1969. Since then it was seen every month until January 1970 after which none was seen again. Like the previous species, it is a bird of dry bush country, but here it inhabited the sage-bush, except for one pair which was seen in the heath-zone in Meru Crater at 2600 m in July.

1441. *VIDUA MACROURA* (Pallas). Pin-tailed Wydah.
A resident of the sage-bush on the borders of the Park in January - June. Courtship noted in March. It is a common bird in cultivations outside the Park.

1448. *SERINUS MOZAMBICUS* (Müller). Yellow-fronted Canary.
A visitor to the sage-bush from cultivated country. Possibly resident in the lower Ngongongare sector.

1454. *SERINUS FLAVIVERTEX* (Blanford). Yellow-crowned Canary.
A resident of the forest canopy and moorland up to the limit of plant growth on Mt. Meru (*c.* 3700 m), but descending during the colder months of April to August to the sage-bush. In 1971 several pairs occupied about half sq. km of *Dodonea-Juniperus* woodland at 1600 m where they bred, nests being found on 4th, 13th, 14th and 16th June.

1459. *SERINUS ATROGULARIS* (A. Smith). Yellow-rumped Seed-Eater.
A rare visitor to sage-bush from the dry Masai steppe.

1461. *SERINUS STRIOLATUS* (Rüppell). Streaky Seed-Eater.
A common resident in bush, woodland, forest edge and heath-zone to limit of plant growth. Many birds descend to the flowering sage-bush in May-July. Nests have been found on 29.6.68, 18.4.69, 17.5.71 and 29.4.71.

1462. *SERINUS BURTONI* (Gray). Thick-billed Seed-Eater.
A resident of forest, forest-edge and lower heath-zone between 1800 and 2500 m.

1463. *LINURGUS OLIVACEUS* (Fraser). Oriole Finch.
A scarce or easily overlooked resident of forest canopy, usually above 1900 m. It has been noted eating *Sedum* leaves.

1464. *CARDUELIS CITRINELLOIDES* (Rüppell). African Citril.
A common mobile resident of sage-bush and secondary growth, woodland and forest-edge up to 1800 m, breeding in November-January and April-June. Nests found as follows:- 30.4.67, 29.6.68, 14.12.68, 4.1.69, 1.6.70, 8.6.70, 23.11.70, 4.12.70, 29.4.71, 3.5.71, 16.5.71, 26.5.71, and 24.6.71.

1469. *EMBERIZA FLAVIVENTRIS* (Stephen). Golden-breasted Bunting.
A rare visitor, noted in January and May in tree-scattered bush. A male was singing in July 1971.

1476. *FRINGILLARIA TAHAPISI* A. Smith. Cinnamon-breasted Rock Bunting.
An uncommon visitor noted in January, October and December in rocky bushland.

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JOURNAL OF THE EAST AFRICA NATURAL HISTORY SOCIETY AND NATIONAL MUSEUM

15th JULY 1972 No. 133

ADDITIONS TO THE MYCOFLORA OF SOUTH-WESTERN UGANDA

By

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INTRODUCTION

The mycoflora of Uganda has probably received more attention than that of other territories in tropical Africa, largely due to the work of C. G. Hansford, Mycologist and then Senior Plant Pathologist to the Uganda Government from 1926 to 1945. The first list of Uganda fungi appears to have been by Miss A. L. Smith (1895) recording material collected by Scott Elliot in the Ruwenzori. The lists of Maitland & Wakefield (1917) and Wakefield (1920) are more comprehensive and the former contains some ecological notes. Hansford published two host lists of Uganda parasitic fungi, each in several parts. The first list (Hansford, 1937a, 1937b, 1937c, 1937d, 1938a) was usefully annotated; the revised list (Hansford, 1943a, 1943b, 1943c) was of nomenclature only. Hansford also initiated the publication of a series of taxonomic papers on Uganda fungi. Two papers on the Meliolinae (Hansford, 1937e, 1938b) were succeeded by one on other Ascomycetes (Hansford, 1941) and others dealing with the Fungi Imperfecti (Hansford, 1943d), the smuts (Ainsworth, 1941), and the rusts (Wakefield & Hansford, 1949). New records and revisions occupied three further papers (Hansford, 1943e, 1944, 1945). Hansford specialized in the dark-coloured foliicolous Ascomycetes, especially the Meliolaceae. There are records and descriptions of new species and varieties of these and other groups from Uganda in papers dealing with fungi from a wider geographical area (Hansford, 1946, 1947a, 1947b, 1949, 1955a, 1955b, 1957, 1958). More recent collections of rust fungi from Uganda are reported by Henderson (1970).

This communication records 19 species of fungi collected (rather spasmodically) during a few days spent in the Ankole, Kigezi, and Toro districts of western Uganda in June 1970. This appears to be the first published Uganda record for 13 of these species, of which 2 are previously undescribed. Four appear to be new host records for Uganda, and 3 records extend the previously reported geographical distribution within Uganda. It is obvious that, although the Uredinales and Meliolineae may now be rather well known, many fungi, both saprophytic and parasitic, still await discovery in Uganda.

Accession numbers with the prefix DLE refer to the author's personal herbarium; that with the prefix S refers to a specimen in the Ukiriguru Plant Pathology Herbarium. Where IMI accession numbers are given, material has been deposited at the Commonwealth Mycological Institute, Kew. Records believed to be new for Uganda, for the host species in Uganda, or for the locality are marked respectively with an asterisk (*) against the fungus, host, or district name. The classification in the list below follows that outlined in the Plant Pathologist's Pocketbook (C.M.I., 1968, pp 5—6).

SYSTEMIC LIST

MYXOMYCOTINA

Myxomycetes

Arcyria denudata (L.) Wettst.*
On old papyrus thatch; 1900m, Kabale, Kigezi, 6. vi. 1970. DLE 128, 133, 134, 137, 138; IMI 151245, 151251, 151254, 151255.

Arcyria cinerea (Bull.) Pers.*
On old papyrus thatch; 1900 m, Kabale, Kigezi. 6. vi. 1970. DLE 129, 136; IMI 151246,151253.

Arcyria incarnata Pers.*
On old papyrus thatch; 1900 m, Kabale, Kigezi, 6. vi. 1970. DLE 139; IMI 151256.

Comatricha laxa Rost.*
On old papyrus thatch; 1900 m, Kabale, Kigezi, 6. vi. 1970. DLE 130, 131, 132; IMI 151247, 151248, 151249.

ASCOMYCOTINA

Sphaeriales

Phyllachora bonariensis Speg.*
On *Setaria homonyma* (Steud.) Chiov. GRAMINEAE. 1900 m, Bwama Is., Lake Bunyoni, Kigezi, 6. vi. 1970. DLE 154; IMI 155321.

Erysiphales

Oidium stage of an Erysiphaceous fungus.
On fruits of an Umbellifer, possibly *Lefebvria* sp.* (not matched in the East African Herbarium). 1800 m, Lake Mulehe, Kigezi, 7. vi. 1970. DLE 156.

BASIDIOMYCOTINA

Ustilaginales

Entyloma dahliae Syd.
On *Dahlia variabilis* (Willd.) Desf. COMPOSITAE. 1900 m, Kabale, Kigezi*, 6. vi. 1970. S 69; 155337.
S 69; IMI 1555337.

Uredinales

Puccinia andropogonis Schw.*
On *Amphicarpa africana* (Hook. f.) Harms. PAPILIONACEAE. Aecidial stage. 1800 m, Lake Mulehe, Kigezi, 7. vi. 1970. DLE 155; IMI 155322.

Puccinia dietelii Sacc.*
On *Chloris pilosa* Schumach. & Thonn. GRAMINEAE. 950 m, Katwe, Toro, 11. vi. 1970. DLE 159; IMI 155325.

Puccinia guizotiae Cumm.*
On *Guizotia scabra* (Vis.) Chiov. COMPOSITAE. 1800 m, Lake Mulehe, Kigezi, 7. vi. 1970. DLE 147; IMI 155314.

Puccinia nakanishikii Diet.
On *Cymbopogon afronardus* Stapf* GRAMINEAE. 1300 m, nr. Kagera River, Nsongezi.

Ankole* 5. vi. 1970. DLE 158; IMI 155324.

Puccinia ocimi Doidge
On *Ocimum suave* Willd. LABIATAE. Aecidial stage. 1800 m, Lake Mulehe, Kigezi*, 7. vi. 1970. DLE 152; IMI 155319.

Uromyces polygoni-avicularis (Pers.) Karst.
On *Polygonum setosulum* A. Rich.* POLYGONACEAE. 1900 m, Kisoro, Kigezi, 7. vi. 1970. DLE 146; IMI 155313.

Aecidium glycines P. Henn.*
On *Glycine javanica* L. PAPILIONACEAE. Parasitized by *Cladosporium* sp. 1800 m, Lake Mulehe, Kigezi, 7. vi. 1970. DLE 161; IMI 155327.

Aecidium matapense Cumm.*
On *Dichrocephala integrifolia* (L.) O. Ktze COMPOSITAE. 1900 m, Kabale, Kigezi, 5 vi. 1970. DLE 148; IMI 155315. Exobasidiales

Kordyana celebensis Gaum.*
On *Commelina benghalensis* L. COMMELINACEAE.
Forming white patches on the leaves. 1900 m, Bwama Is., Lake Bunyoni, Kigezi, 6. vi. 1970. DLE 151; IMI 155318.

DEUTEROMYCOTINA

Hyphomycetes

Cercospora kigeziensis D. L. Ebbels & F. C. Deighton* sp. nov.

Maculae amphigenae, ellipticae, atro-fuscae, usque 14×6 mm, centro interdum pallidiore; caespituli numerosi amphigeni, crebri, in epiphyllo dispersiores; stromata olivaceo-brunnea, usque 135×50 µm; conidiophora dense fasciculata, pallide olivacea, recta vel sinuosa, simplicia, 0—2 septata, usque 80 µm longa et 4.5 µm lata, cicatrices conidiales inconspicuae, non incrassatae; conidia subcylindrica, levia, plerumque leniter curvata, apicem versus leniter attenuata, pallide olivacea, apice obtusa, hilo truncato non incras sato 2.5–3.0 µm diam., 3–12 septata, non constricta, 40–80×3.4–4.8 µm (Fig. 1).

Hab. in foliis Polygalae ruwenzoriensis Chod. POLYGALACEAE. Lake Mutanda, Kigezi Dist., Uganda Alt. 1,850 m, 7. vi. 1970. DLE 150; IMI 155317 typus.

Spots on both corresponding surfaces of the leaves, elliptical, dark brown, up to 14×6 mm, sometimes with paler centres; caespituli numerous on both leaf surfaces, crowded, more scattered on the adaxial surface; stromata olive-brown, up to 135×50 µm; conidiophores densely fasciculate, pale olive-brown, straight or sinuous, simple, 0–2 septate, up to 80 µm long and 4.5 µm wide, conidial scars inconspicuous, unthickened; conidia subcylindric, smooth, usually slightly curved, slightly attenuate towards the apex, pale olive, obtuse at the apex, with a truncate unthickened hilum 2.5–3.0 µm diam., 3–12 septate, not constricted, 40–80×3.4–4.8 µm (Fig. 1).

On leaves of *Polygala ruwenzoriensis* Chod. POLYGALACEAE. Lake Mutanda, Kigezi Dist., Uganda. Alt. 1,850 m, 7. vi. 1970. DLE 150; IMI 155317 type.

Among the numerous species which have been described in the very large genus *Cercospora* are several hundred showing characters (including the unthickened conidial scars) more or less similar to those of *C. kigeziensis* which, although not a true *Cercospora*, is best placed in that genus pending its thorough taxonomic revision.

In genera such as *Cercospora* it is customary to distinguish species according to their hosts. Although this leads to an undesirable multiplicity of names for morphologically very similar fungi, it is the most convenient system to use until the various host ranges are more fully investigated; a task which will take many years. Eventually it is possible that the creation of *formae speciales* to distinguish morphologically similar forms with differing host ranges might provide an acceptable solution to this problem in the classification of the *Cercospora* complex, as it has done in the classification of *Fusarium oxysporum* Schlecht. emend. Snyder & Hansen.

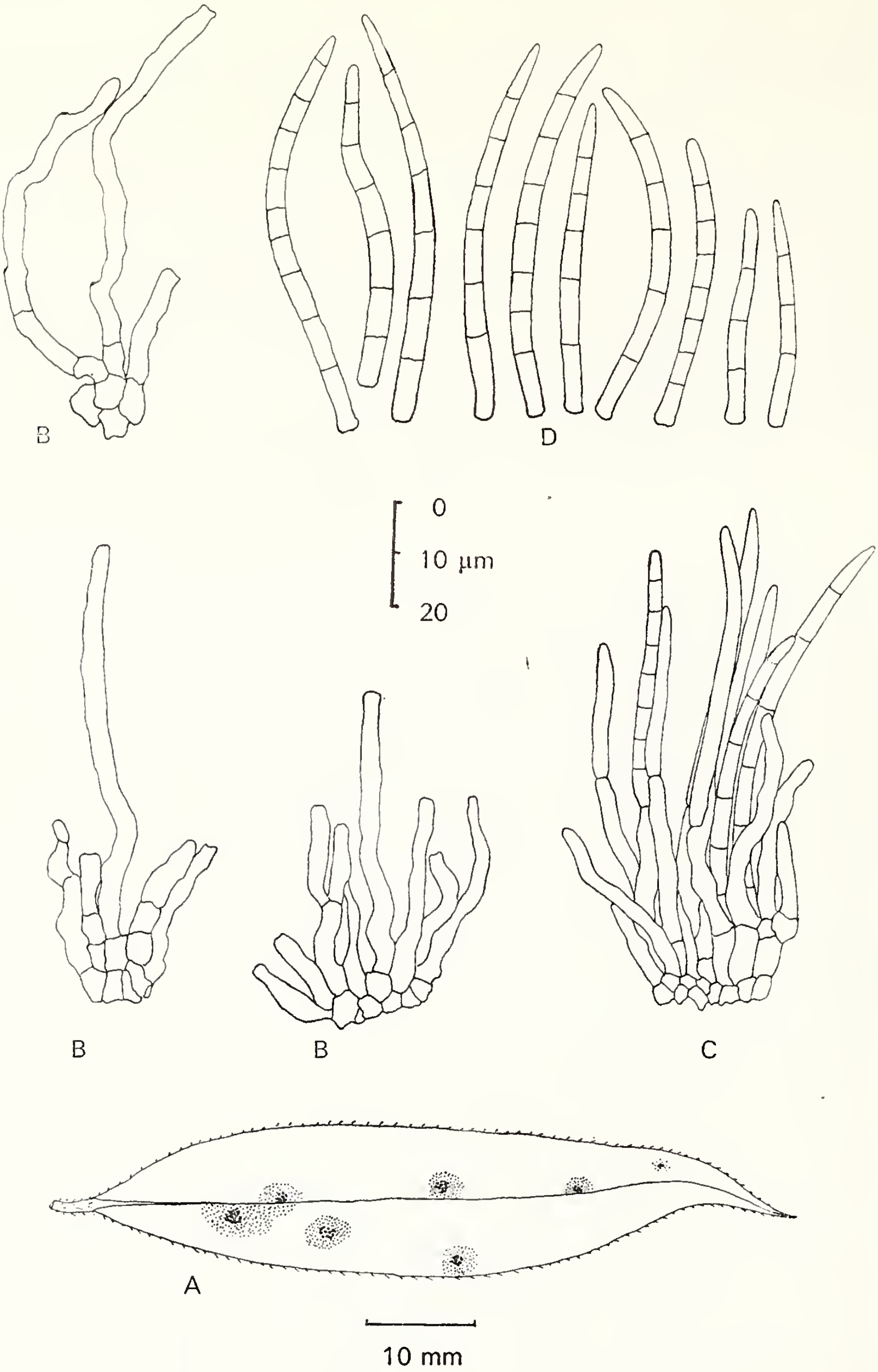

Fig. 1. *Cercospora kigeziensis.* A, spots on leaf of *Polygala ruwenzoriensis;* B, caespituli with stromata and conidiophores; C, caespitulum showing conidiophores with conidia attached; D, conidia.

Fusarium sp.

On *Pennisetum trachyphyllum* Pilg.* GRAMINEAE. Associated with a leaf blotch. 1900 m, Bwama Is., Lake Bunyoni, Kigezi, 6. vi. 1970. DLE 165; IMI 155331.
Ramularia-like fungus undescribed.*

On *Pavonia urens* Cav. var. *tomentosa* (Ulbr.) Brenan MALVACEAE. Leaf spot. 1,800m, Lake Mulehe, Kigezi, 7. vi. 1970. DLE 153; IMI 155320.

The spots are circular, up to 5 mm diameter, with a very dark purplish-brown margin. The hyaline conidia and conidiophores impart a whitish centre to sporulating spots. Mr. F. C. Deighton (C. M. I.) comments: 'A *Ramularia*-like fungus, undescribed. Same as IMI 68741 from Kenya on the same host, but in better condition. . . . The conidial scars are not as conspicuous as in the type of *Ramulariopsis*.' It appears that further studies on other collections of this fungus and its near relatives are required before its true taxonomic position can be firmly ascertained. For this reason it is merely reported in this communication and is not scientifically described.

ACKNOWLEDGEMENTS

I thank Mr. J. B. Gillett and the staff of the East African Herbarium, Nairobi, for help in identification of the host plants, and the staff of the Commonwealth Mycological Institute, Kew, for help in identification of the fungi. In particular I am most grateful to Mr. F. C. Deighton of the Commonwealth Mycological Institute for valuable help and advice in the preparation of this paper.

SUMMARY

The literature on Ugandan fungi is briefly reviewed. Nineteen species of fungi collected in 1970 in the Ankole, Kigezi and Toro districts are listed. Thirteen species are believed to be new records for Uganda, including 2 previously undescribed species. *Cercospora kigeziensis* Ebbels & Deighton sp. nov. is described.

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THE OCCURRENCE OF THE SHRIMP *METAPONTONIA FUNGIACOLA* BRUCE (CRUSTACEA, DECAPODA, PONTONIINAE) IN KENYAN WATERS.

By

A. J. BRUCE.*

East African Marine Fisheries Research Organization.

The monospecific pontoniinid genus *Metapontonia* was first described on the basis of a single damaged specimen, probably male, obtained from washings of a coral of the genus *Fungia* spp., collected in the Comoro Islands during the course of the International Indian Ocean Expedition in 1964 (Bruce, 1967). There have been no subsequent reports of the occurrence of this highly specialized coral commensal.

This report records the presence of further specimens in shallow water on the reefs of southern Kenya and also indicates that the species is not restricted to corals of the family Fungiidae in its associations.

Specimens have been deposited in the collections of the National Museum, Nairobi, and the Rijksmuseum Van Natuurlyke Historie, Leiden.

METAPONTONIA FUNGIACOLA Bruce.

Metapontonia fungiacola Bruce, 1967, *Zool. Verh.*, Leiden, **87:** 23-32, figs. 10-12.

Material examined:

1 ovig. ♀ 2 ♂ Stn. 138, 1650, Jadini, Kenya, 4° 21.5′S., 39° 34.5′E, Coll. A.J.B., 3 November, 1971.

Description: The present specimens agree closely with the original description. The female is distinctly larger and more robust than the males.

All three specimens possess both second pereiopods, which are small, robust, similar and distinctly unequal in size.

The male first and second pleopods were missing from the holotype specimen and have not been described. The endopod of the first pleopod is about 2.5 times longer than broad, with the greatest width situated at half the length. The medial border is feebly concave and bears two coarsely setulose setae proximally and two short curved spines at one third of its length. The distal margin is rounded. The lateral border is gently convex with six finely plumose setae along the distal two-thirds of the margin. The endopod of the second pleopod bears a slender appendix interna, with four terminal concinni, which distinctly exceeds the appendix masculina. The body of the appendix masculina is short and stout, about twice as long as broad, with three terminal setae.

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Two setae are stout, long and straight 0.20 and 0.14 mm in length. The longer seta are finely setulose. The third seta is short and curved, about 0.06 mm in length and devoid of setules.

Measurements:- (mm)

	♂	♀	♀
Total carapace length	2.10	1.70	1.60
Post-orbital carapace length	1.55	1.15	1.15
Major second pereiopod chela	1.40	1.05	1.40
Minor second pereiopod chela	1.05	0.75	0.90
Number of ova	11	—	—
Greater diameter of ova	0.56	—	—

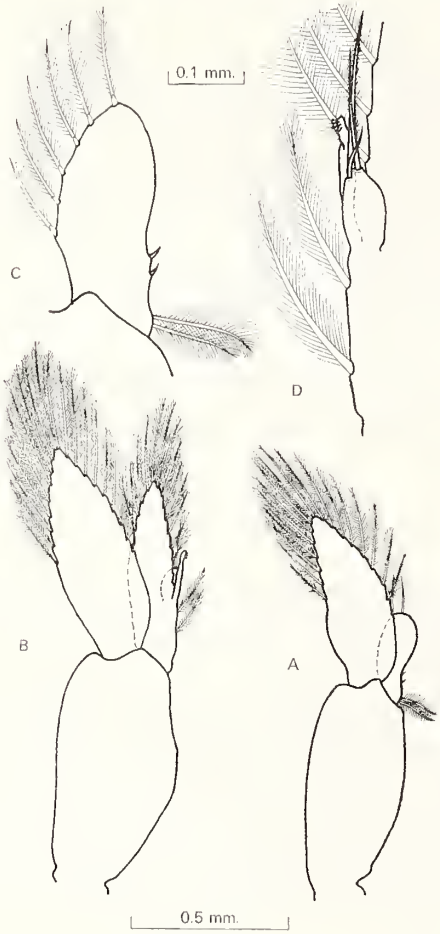

Fig. 1.—*Metapontonia fungiacola* Bruce. A) male first pleopod. B) male second pleopod. C) endopod of male first pleopod. D) appendix interna and appendix masculina of male second pleopod.

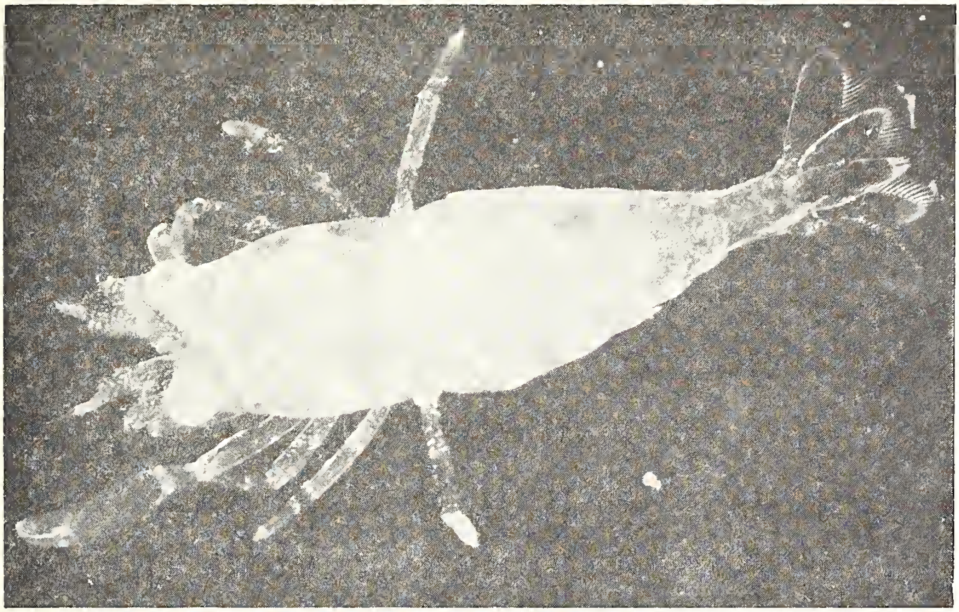

Plate 1—*Metapontonia fungiacola* Bruce. Ovigerous female, dorsal view.

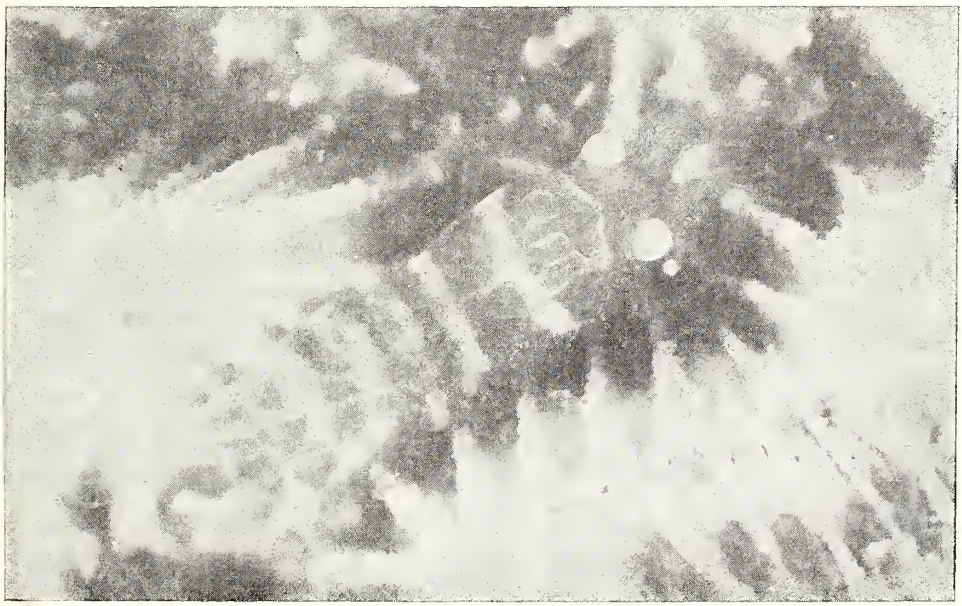

Plate 2—*Metapontonia fungiacola* Bruce. Ovigerous female *in situ* and host *Hydnophora microconos* Lam.

Colouration:- The general appearance of the female was yellow-green, the males being more highly transparent. In more detail, the female is generally feebly speckled with pale yellowish chromatopheres, which are only feebly visible. It shows a patch of small white chromatopheres in each post-orbital region with a larger transverse patch of white across the gastric region. The rostrum is colourless and the branchiostegite is sparsely speckled with small white dots. The abdomen shows a transverse dorsal band of white across the first segment, extending laterally to the posterior angle of the branchiostegite. The pleura are generally finely speckled with white, with three larger patches of white on the second and third pleura laterally, which also extend across the ventral aspect of the abdomen. The sixth abdominal segment and caudal fan are almost completely transparent, except for a few yellow-green dots ventrally on the terminal abdominal segment. The antennal peduncles and scaphocerite are heavily speckled with yellow-white. The pereiopods are colourless except for the ischium and proximal two-thirds of the merus of the ambulatory pereiopods. The clearly visible ovary is olive green and the undeveloped ovary are of a similar colour.

Behaviour:- The shrimps show few signs of activity in daylight. They take up position between the raised projections of the host, with the body held close to the base of the depression and the third to fifth pereiopods held upwards beside the carapace, with the dactyls holding on to the more elevated parts of the corallites. The abdomen was noted to be frequently held in an elevated position, away from the substrate and with the caudal fan flexed.

Habitat:- The specimens were obtained from the seaward side of a fringing lagoon, in water about 2m in depth, with a temperature of 28.5°C.

Host:- *Hydnophora microconos* Lam. (Faviidae)

Distribution: Previously known only from Pamanzi reef, Mayotte Island, Comoro Archipelago.

DISCUSSION

The holotype of *Metapontonia fungiocola* was found in the washings from a number of specimens of *Fungia* which included several species. The occurrence of the present specimens in association with *Hydnophora microconos* shows that it is not restricted in its association to corals of the family Fungiidae but can also be associated with the Faviidae. In general commensal pontoniinid shrimps associated with corals show considerable specificity in their associations and are usually restricted to family or generic categories.

The holotype specimen was damaged and lacked the anterior pleopods. Its sex and maturity could not be adequately determined. The Jadini specimens show that the specimens are normally mature at a very small size and indeed, *Metapontonia fungiacola* appears to be one of the smallest pontoniinid shrimps. The ova are of typical size for a pontoniinid shrimp but, correlated with the small size of the female, only a very small number are carried.

Metapontonia fungiacola may well be widespread in its distribution as its small size would result in its being easily overlooked. Mortensen (1923) has reported the presence of a small shrimp in association with *Fungia* corals in the Kei Islands, which could possibly belong to the present species.

ACKNOWLEDGEMENT

I am most grateful to Professor J. W. Wells for the identification of the coral host.

RESUME

Nous reportons ici la présence de *Metapontonia fungiacola* Bruce, a Jadini, près de la frontière sud du Kenya. Cette crevette pontoniinide n'est connue que par son occurrence originale dans l'ile Mayotte qui fait parti de l'archipel des Comores. Le motif de couleurs, et la première et la deuxième pléopode du male, sont décrits pour la première fois. Les spécimens de Jadini, ont été trouvés dans la lagon marginal, en association avec une corail faviide, *Hydnophora microconos* Lam. qui constituent un nouveau genre d'hote.

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10th October 1972 No. 135

SEASONAL AND REGIONAL ABUNDANCE OF FLEAS ON HARES IN KENYA

By

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INTRODUCTION

Two species of hares occur in Kenya: *Lepus capensis* L., which lives on open grassland over most of the country, and *Lepus crawshayi* de Winton (=*L. whytei* Thomas) which inhabits scrubbier country to the south and west. During a study of the reproduction of *L. capensis* (Flux 1969 and in prep.) the opportunity was taken to study their external parasites. Apart from fleas, the hares carried many ticks (to be reported separately), a few lice, and two hippoboscid flies.

METHODS

From August 1967 to July 1968 monthly samples of ten hares (*L. capensis*) were shot on each of three areas: (i) at 19 km south of Magadi township (2°5′S, 36°14′E), (ii) near Olorgesailie Prehistoric Site (1°34′S, 36°28′E), and (iii) at Akira Ranch (0°57′S, 36°26′E). These lie at 600, 1200 and 1800 m altitude respectively on the floor of the Great Rift Valley running north to south across Kenya, about 60 km west of Nairobi. Mean annual temperatures decreased from 29°C at Magadi to 18°C at Akira, while mean annual rainfall increased from 410 to 772 mm. Temperatures vary little throughout the year and the main variable is rainfall, which comes in two roughly defined wet seasons: the "short rains" from October to December, and the "long rains" from March to May.

The vegetation at Magadi and Olorgesailie is dry grassland with mixed scrub and a few scattered trees, and at Akira mainly *Themeda* grassland with whistling thorn scrub (*Acacia drepanolobium* Harms ex Sjöstedt). Magadi and Olorgesailie are owned by the Masai and tend to be rather overgrazed by cattle, sheep and goats; Akira is a European-owned ranch carrying cattle, goats and wild ungulates, especially Grant's and Thomson's gazelles (*Gazella granti* Brooke, *G. thomsonii* Gunther). Other wild game and several species of carnivores are common on all three areas.

Hares were shot with a .22 calibre rifle by spotlighting from a Land-Rover at night, wrapped in newspaper to absorb blood, and sealed individually in polythene bags in the field. No other mammals or birds were collected or transported in the vehicle, so the possibility of accidental transfer of fleas from one host to another was virtually eliminated.

Next morning the hares were searched for external parasites in the laboratory and as each animal was handled for at least 20 minutes while I skinned it, probably most fleas were collected. Fleas were preserved in 70 per cent alcohol and later identified by Mr. F.G.A.M. Smit, British Museum (Natural History), Tring. The few seen to escape are recorded as "unsexed" in the tables.

In addition to the regular collections of *L. capensis*, nine *L. crawshayi* were examined from Mt. Margaret, just east of Akira Ranch; 12 from near Kilgoris, West Kenya (1°10′S, 34°50′E); two from the plains near Nairobi; five from 2200 m altitude on the Ngong Hills; and two from 2700 m on Mt. Kenya.

RESULTS

Species and sex ratios of fleas

From 152 of 365 *L. capensis* examined, 639 fleas were collected: 560 *Ctenocephalides felis strongylus* (Jordan), 78 *Echidnophaga gallinacea* (Westwood), and one *Xenopsylla nubica* (Rothschild). Of 30 *L. crawshayi* examined, 24 had a total of 139 *C. f. strongylus* and one *E. gallinacea.* The cat flea, *C. f. strongylus,* occurs throughout eastern and central Africa as the common flea on hares, cats, dogs, goats, sheep, and a wide range of wild carnivores. It is by far the commonest flea on man in this area, almost completely replacing *Pulex irritans* L. (Hopkins 1947). The sticktight flea, *E. gallinacea,* is a cosmopolitan species which, like the cat flea, is found on a variety of hosts from poultry to large carnivores. It occurred only on the face and whiskers of the hares. *Xenopsylla nubica* is a rodent flea found especially on gerbils (*Tatera* spp.) in East Africa: the one male found, on a juvenile male *L. capensis* at Olorgesailie, was clearly a straggler.

The sex ratio of cat fleas from *L. capensis* was 123 ♂♂:242 ♀♀ at Akira, 65 ♂♂: 111 ♀♀ at Olorgesailie, and 2 ♂♂:3 ♀♀ at Magadi; and from *L. crawshayi* from several areas in Kenya, 34 ♂♂:104 ♀♀. Sex ratios on male (117 ♂♂:246 ♀♀) and female (107 ♂♂:214 ♀♀) hares were similar. The average numbers of fleas carried by 201 male (1.81) and 188 female (1.71) hares were also similar, but juvenile hares (i.e. those less than about 8 months old) had fewer fleas than had adults (Table 1). The overall sex ratio of cat fleas on hares, 224 ♂♂:460 ♀♀ or approximately 1:2, seems normal. Hopkins & Rothschild (1953) catalogue 20 ♂♂:40 ♀♀ for Kenya collections, and 219 ♂♂:479 ♀♀ for the whole Ethiopian region; de Meillon *et al.* (1961) record 208 ♂♂:491♀♀ in South Africa; and Harmsen & Jabbal (1969) found 19 ♂♂:64 ♀♀ in Kenya. All these were from a variety of hosts.

The sex ratio of sticktight fleas on hares (22 ♂♂:56 ♀♀) seems unusual because of the large number of male fleas found, although Hopkins' (1947) remark, that "Females enormously outnumber males in collections, the proportion of males in an extensive series of surveys in Kenya never exceeding 10 per cent in any locality, and usually being much below that figure . . .", appears exaggerated. Thus Hopkins & Rothschild (1953) catalogue 3 ♂♂:25 ♀♀ for Kenya, but 64 ♂♂:324 ♀♀ for the Ethiopian region; and de Meillon *et al.* (1961) give 361 ♂♂:1618 ♀♀ for South Africa. In fleas emerging from a variety of hosts' nests or lairs, however, de Meillon *et al.* found both sexes almost equally common (270 ♂♂:310 ♀♀), and hares may pick up fleas from such places rather than from other hosts.

Number of fleas per hare

The frequency distributions of fleas per hare at Akira and Olorgesailie differed (Fig. 1). In both places roughly similar proportions of hares had cat fleas—75 of 125 (60%) and 64 of 119 (54%) respectively—but the total of fleas at Akira (370) was double that at Olorgesailie (185) because a few hares had many fleas each at Akira. At Olorgesailie more hares than expected had three and four fleas. These patterns could be explained by concentration of fleas at stock camps and higher densities of fleas at Akira than at Olorgesailie. A separate analysis of hares shot within 3 km of stock camps at Olorgesailie supports this suggestion for they had more than twice as many fleas as did those shot farther away:

	Number of fleas										
No. of hares	0	1	2	3	4	5	6	7	8	14	*Mean*
Near stock camps:	5	5	2	8	4	1	1	0	2		2.7
Away from stock:	50	19	4	9	2	0	3	1	0	1	1.1

At Akira, hares with many fleas tended to have more female fleas than expected by chance, and fewer hares than expected had fleas with the average sex ratio (Table 2), as

TABLE 1

Occurrence and sex of fleas (*Ctenocephalides felis strongylus* and *Echidnophaga gallinacea*) on *Lepus capensis* at Akira Ranchand and Olorgesailie, and on *L. crawshayi* from several areas in Kenya

Host species:	*Lepus capensis*								*L. crawshayi*			
Area:	Akira Ranch				Olorgesailie				Several areas			
Age and	Adult		Juvenile		Adult		Juvenile		Adult		Juvenile	
sex of host:	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
No. hares examined	41	39	21	24	40	37	23	19	10	9	7	4
No. hares with fleas	31	30	12	9	25	20	12	8	9	5	6	4
Hares with *C.f.strongylus*	26	29	11	9	24	20	12	8	9	5	6	4
No. male ,, ,,	51	49	14	9	24	26	10	5	11	8	5	10
No. female ,, ,,	121	88	21	12	39	39	17	16	26	32	21	25
No. unsexed ,, ,,	1	0	3	1	6	0	1	2	1	0	0	0
Hares with *E. gallinacea*	12	4	1	2	1	0	0	0	0	0	1	0
No. male ,, ,,	14	1	0	5	2	0	0	0	0	0	0	0
No. female ,, ,,	31	3	1	16	4	0	0	0	0	0	1	0

Notes: At Olorgesailie one unsexed *E. gallinacea* was recorded on the adult male hare, and one male *Xenopsylla nubica* on a juvenile male hare.

TABLE 2

Frequency distribution of sex ratios of cat fleas on hares at Akira Ranch and Olorgesailie, compared with the random distributions expected for sex ratios of 1♂ :2♀♀. The trends in the "Difference" column show that sex ratios of fleas are probably random at Olorgesailie but not at Akira.

AKIRA RANCH

		No. of fleas per hare: 43	30	24	17	15	12	11	10	9	8	7	6	5	4	3	2	1	Total	Expected	Difference
No. females in excess of males	21	1																	1		+
	20		1																1		+
	10						1												1		+
	9																				
	8						1												1	0.06	+
	7				1														1	0.27	+
	6																			0.54	
	5					1		1				1		1					4	2.2	+
	4			1							1								2	2.7	—
	3									2				3		1			6	7.1	—
	2								1						1		5		7	8.7	—
	1							1				2				4		15	22	27.2	—
Females and males equal	0												1				7		8	7.6	+
No. males in excess of females	1											1		1		1		12	15	14.1	+
	2												1		1		2		4	2.7	+
	3															1			1	0.8	+
	4																			0.16	
	5																			0.05	
	6																				
Total		1	1	1	1	1	2	2	1	2	1	4	2	5	2	7	14	37	74	74.0	

OLORGESAILIE

		Difference	Expected	Total	No. of fleas per hare: 1	2	3	4	5	6	7	8	14
No. females in excess of males	21												
	20												
	10												
	9												
	8		0.04										
	7		0.23										
	6	+	0.46	1						1			
	5		1.8										
	4	+	2.3	3				2				1	
	3	—	5.9	4			3				1		
	2	+	7.3	9		5		1		2		1	
	1	+	22.8	23	15		7		1				
Females and males equal	0	—	6.4	3		1		1					1
No. males in excess of females	1	+	11.9	16	9		7						
	2	+	2.3	2				2					
	3		0.7										
	4		0.14										
	5		0.03										
	6	+		1						1			
Total			62.0	62	24	6	17	6	1	4	1	2	1

Note: The Olorgesailie half of this table is reversed so that the "Difference" columns can be compared more easily.

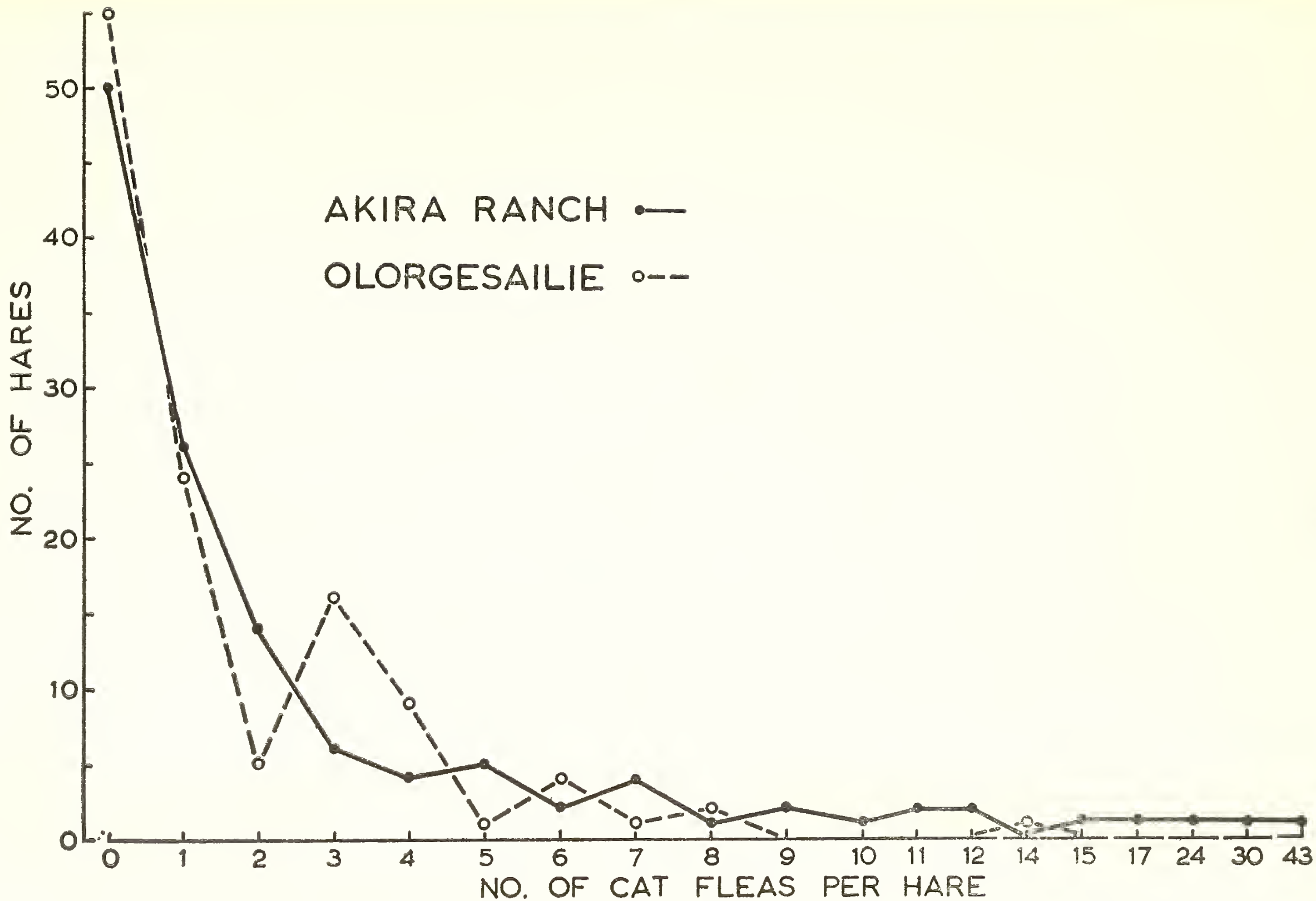

Fig. 1—Frequency distributions of fleas per hare at Akira Ranch and Olorgesailie.

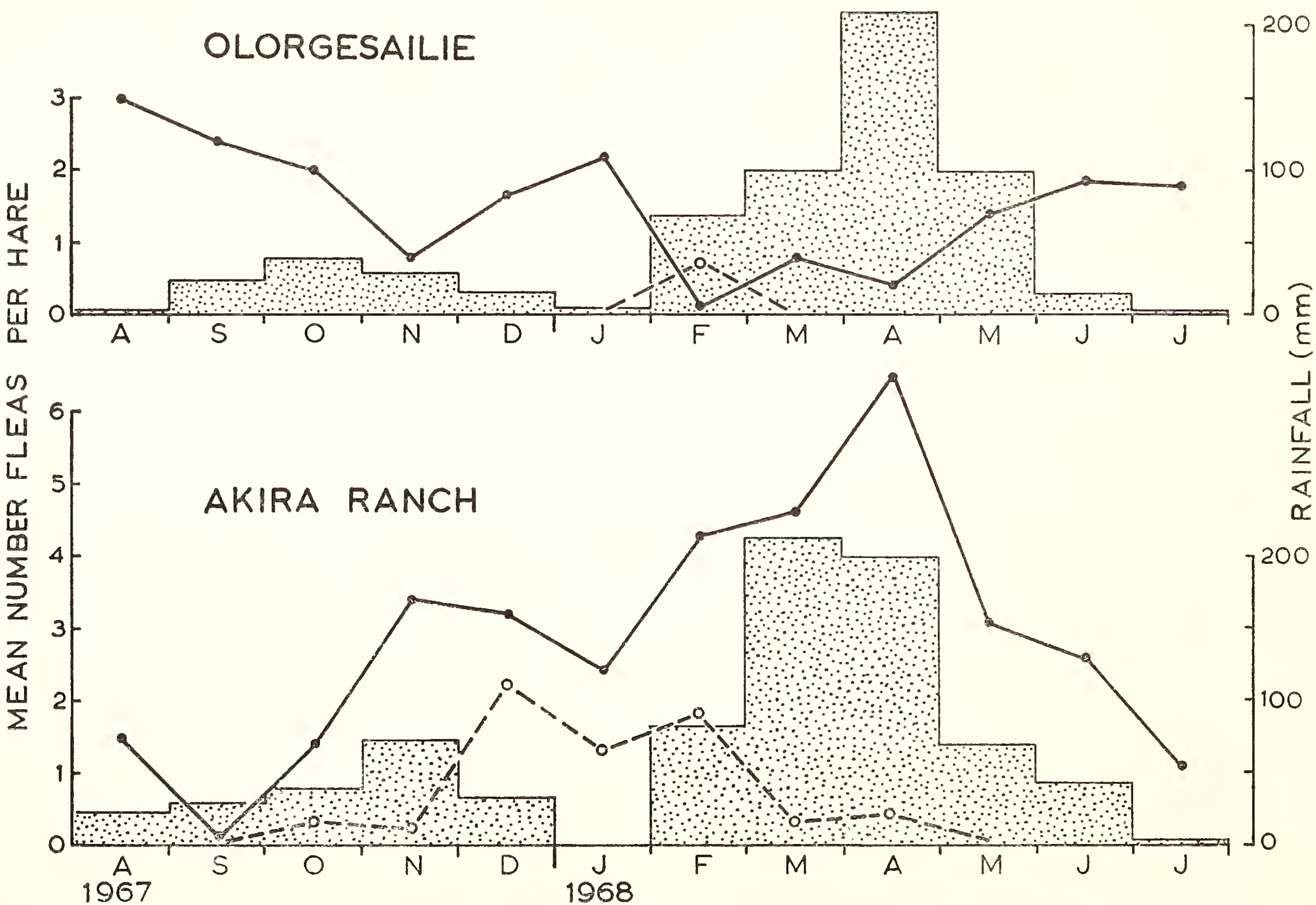

Fig. 2—Seasonal abundance of fleas (*C. f. strongylus*—continuous line; *E. gallinacea*—dashed line) on hares at Akira Ranch and Olorgesailie compared with rainfall (stippled).

indicated by departures from the random binomial distribution calculated for a sex ratio of 1 ♂:2 ♀♀. Olorgesailie hares, on the other hand, had fleas with random sex ratios. This is rather surprising as it indicates that the fleas attached to hosts regardless of the sex of other fleas present; that is, there was no tendency for a male flea to leave a host if it did not find a mate or for male and female fleas to behave in different ways. A possible explanation is that fleas were within their breeding range at Akira but not at Olorgesailie.

Regional and seasonal abundance of fleas

Although there seemed to be as many big game animals, carnivores and domestic animals at Magadi as at Olorgesailie, and far more hares, only five fleas (all *C. f. strongylus*) were collected at Magadi: two males from juvenile male hares, and three females from an adult male, an adult female and a juvenile female hare. Since 121 hares were examined at Magadi, this area is clearly unsuitable for fleas, probably because mean maximum temperatures average 35°C and humidity is low, averaging 35–56 per cent compared with 50–80 per cent at Nairobi (Thompson & Sansom 1967). Temperatures and humidity at Akira were similar to those at Nairobi and conditions at Olorgesailie were intermediate between those at Nairobi and Magadi.

Abundance of cat and sticktight fleas at Akira was correlated with the seasonal rainfall (Fig. 2) as it is for many insects in Kenya. The pattern at Olorgesailie was exactly reversed, with cat fleas most abundant in the dry seasons. Possibly the fleas breed successfully only at high altitudes, as at Akira, and the pattern at Olorgesailie reflects the seasonal migrations of the Masai and their stock. The Olorgesailie area is grazed from March to June and during October and November (Hickman & Dickens 1960); and during the dry seasons, when many Masai and their cattle, sheep, goats and donkeys are absent, the fleas may find that hares are the only hosts available. Some wild ungulates in the Rift Valley also migrate, which would add to this effect.

DISCUSSION

Whether hares are true hosts of fleas or merely accidental carriers is debatable. Hopkins (1947) states: "The common flea of hares in East Africa is also the common flea of cats, dogs, goats, sheep, and a wide range of Carnivora: it occurs on many of these hosts, including cats, goats and hares, in such numbers as to put it beyond doubt that these are not accidental occurrences"; and the Rothschild collection contains male *C. f. strongylus* from Uganda and Tanganyika "belonging to a form in which the number of sub-apical spiniform plantar bristles . . . varies from 2 to 6—this form apparently occurs exclusively on wild Carnivora and hares" (Hopkins & Rothschild 1953: 155). On the other hand, fleas might be unable to complete their life cycle using hares alone, because hares sit by day in open "forms" in grass or under bushes, and have no lairs. The "forms" may be used continuously for a few weeks but are kept so clean and dry that larval fleas could find little food.

Harmsen & Jabbal (1960) emphasise the danger of considering any animal carrying a flea, the host of that particular flea. They illustrate this by mentioning that the highly host-specific *Delopsylla crassipes* Jordan, normally restricted to the springhaas, *Pedetes surdaster* Thomas, "was, however, also found on the hare, *Lepus capensis*, but only on those hares which live within the confined area of a springhaas colony". As this statement was based on one flea from one hare, it is worth recording that I found no *D. crassipes* on five hares shot within a springhaas colony, reinforcing their view that this flea is only a straggler on hares.

The occurrence of equal numbers of fleas on male and female hares is perhaps unexceptional, although significantly more fleas have often been recorded on male mammals (Ashby & Crawley 1967, Cotton & Watts 1967, Gabbutt 1951, Haas 1965), possibly associated with their larger home ranges (Mohr & Stumpf 1962). On the other hand, 44 per cent more adult males than adult females of *L. capensis* carried ticks, and

females carried almost three times as many plant propagules in their fur as males did (Agnew & Flux 1970). These differences could be explained by postulating that female hares inhabit scrubby vegetation where burs are more plentiful; that ticks prefer male hares (ticks are attracted by hormone levels in the host's blood—Ali & Sweatman 1966, Rechav 1970) or the more open habitat that male hares may occupy; and that fleas are picked up at random on both types of terrain. With a total of 38 species of ticks, fleas and burs involved, so many other explanations are possible that further discussion is unprofitable until more is known of the habits of both the hares and their parasites.

SUMMARY

Of 365 hares (*Lepus capensis*) collected in monthly samples of 30 for a year from the Great Rift Valley, 152 carried totals of 190 ♂ and 356 ♀ *Ctenocephalides felis strongylus*, 22 ♂ and 56 ♀ *Echidnophaga gallinacea*, and 1 ♂ *Xenopsylla nubica*. Scrub hares (*L. crawshayi*) had more fleas: 24 of 30 examined from various parts of Kenya carried 34 ♂ and 104 ♀ *C. f. strongylus*, and 1 ♀ *E. gallinacea*. Abundance of *C. f. strongylus* on *L. capensis* varied between areas up to 3.0 fleas per hare, and seasonally up to 6.0 fleas per hare, with peak numbers of fleas in the wet seasons in one area and in the dry seasons in another.

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EAST AFRICAN BIRD RINGING REPORT 1970–1971

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INTRODUCTION

This report covers the period 1st July 1970 to 30th June 1971. The total number of birds ringed was 17513 (see Table 1), an increase of 3000 over the previous year's total (Backhurst 1971); however, 10630 Palearctic migrants of 61 species are included in this figure compared with only 6084 ringed during the previous year.

The full list of birds ringed is given in Table 1 where Palearctic migrants are printed in bold type; birds which are Ethiopian as well as Palearctic are printed in ordinary type. The nomenclature used follows the lists of C.M.N. White (references given in Backhurst 1970) and as these lists are regarded as the standard for the Ethiopian Region, authors' names have been omitted. One map is included in this report showing the year's recoveries outside East Africa. Previous recoveries were shown on two maps in last year's report (Backhurst 1971).

SOME NOTES ON RINGING IN EAST AFRICA

Twenty-one ringers were operating in the three East African countries of Kenya, Uganda and Tanzania during the 1970–71 ringing year. Most ringers were in Kenya while very few were in the other two countries; a list of ringers is given on page 13.

This year's 19 Palearctic recoveries are most encouraging and should inspire those who specialize in Palearctic migrants to ring more of them. Some interesting recoveries may be mentioned: the female Ruff *Philomachus pugnax* No. B.4166 was ringed on 10th May 1970 at Lake Nakuru, Kenya when it weighed 137g, some 49 per cent above the mean winter weight (Pearson *et al.* 1970); however, in 1971 it was recovered near Nadym in the Soviet Union (over 65°N., and 72°E.) on 15th April, i.e. three weeks earlier than 10th May when, the year before, it had still been south of the equator. The European Swallow *Hirundo rustica* No. J.37100 was the first East African-ringed bird to be controlled in the U.S.S.R., by Dr E. I. Gavrilov at the Chokpak Pass in Eastern Kazakhstan; in addition, J. F. Reynolds controlled one of Dr Gavrilov's Swallows in Iringa. The Swallow continued to give the high recovery rate mentioned in last year's report (Backhurst 1971).

Pride of place for startling recoveries must go to the three non-hirundine Passerines (other than wagtails) which were recovered in the Middle East: the Kabete Reed Warbler *Acrocephalus scirpaceus* to Saudi Arabia, the Ng'iya Blackcap *Sylvia atricapilla* to Iran and the Mbale Redstart *Phoenicurus phoenicurus* to Iraq. The Redstart recovery was made

exactly one month after it had been retrapped at the ringing site. Some ringing totals of individual species are also worthy of note: 900 Little Stints *Calidris minuta* (but still no recoveries), 818 Ruff, 188 Marsh Sandpipers *Tringa stagnatilis*, 622 Striped Swallows *Hirundo abyssinica*, 2770 European Swallows, 1029 Willow Warblers *Phylloscopus trochilus*, 202 Red-chested Sunbirds *Nectarinia erythroceria* and 355 Dark-capped Bulbuls *Pycnonotus barbatus*. Twelve Palearctic species were ringed for the first time during the year, these were (with number ringed in parentheses): Pallid Harrier *Circus macrourus* (1), Spotted Crake *Porzana porzana* (1), Common Tern *Sterna hirundo* (1), Red-necked Phalarope *Phalaropus lobatus* (2), Black-tailed Godwit *Limosa limosa* (1), Whimbrel *Numenius phaeopus* (1), European Cuckoo *Cuculus canorus* (1), European Scops Owl *Otus scops* (1), European Nightjar *Caprimulgus europaeus* (1), Pied Flycatcher *Ficedula hypoleuca* (2), Chiffchaff *Phylloscopus collybita* (1), and White-throated Robin *Irania gutturalis* (3). The addition of these twelve birds has raised the number of Palearctics ringed since 1960, when the scheme started, to 79 although only 61 species were ringed in the year under review. As a final numerical exercise it is interesting to abstract those species whose grand totals top 1000; there are just ten: Little Stint, Ruff, Striped Swallow, European Swallow, African Sand Martin *Riparia paludicola*, European Sand Martin *R. riparia*, Yellow Wagtail *Motacilla flava*, Willow Warbler, Yellow-backed Weaver *Ploceus melanocephalus* and Dark-capped Bulbul.

More ringers are still needed in East Africa especially if they are experienced and, in this context, visiting ringers from overseas are especially welcome but they are reminded that the East African Scheme uses its own rings and, as the stocks held are not particularly large by European standards, those intending to visit East Africa for ringing should contact the writer as soon as their plans are finalized so that more rings can be ordered if necessary.

ACKNOWLEDGEMENTS

Ringers gratefully acknowledge the co-operation of the City Engineer, Nairobi for allowing them to operate at Kariobangi Sewage Works; the Director of the Kenya National Parks for permission to ring at Lake Nakuru and in Tsavo National Parks; the Director of Veterinary Services, Kenya for permission to ring on certain land at Kabete. The Society is also grateful to the Administrative Director of the National Museum, Nairobi for allowing the Museum's address to appear on the rings.

I should like to thank the East Africa Natural History Society for the grant they made towards the cost of sending me to the XV International Ornithological Congress in The Hague in September 1970.

TABLE I

BIRDS RINGED BY THE EAST AFRICA NATURAL HISTORY SOCIETY RINGING ORGANIZATION

Palearctic Migrants in Bold Type	1970/71	Grand Total
Podiceps ruficollis Little Grebe	0	1
Ardeola ibis Cattle Egret	0	1
A. ralloides Squacco Heron	0	1
Ixobrychus minutus Little Bittern	1	2
Nycticorax nycticorax Night Heron	0	1
Phoenicopterus minor Lesser Flamingo	0	12
Platalea alba African Spoonbill	0	73
Threskiornis aethiopica Sacred Ibis	0	7
Alopochen aegyptiaca Egyptian Goose	0	1
Anas capensis Cape Wigeon	67	235
A. erythrorhynchos Red-billed Duck	11	54
A. hottentota Hottentot Teal	1	121
A. querquedula Garganey	4	11
A. undulata Yellow-billed Duck	1	37
Netta erythrophthalma African Pochard	0	4
Dendrocygna bicolor Fulvous Tree-Duck	0	1
Accipiter badius Shikra	0	3
A. minullus Little Sparrow Hawk	0	1
A. tachiro African Goshawk	0	1
Circus macrourus Pallid Harrier	1	1
Lophaetus occipitalis Long-crested Eagle	0	1
Milvus migrans ssp. Kite	1	1
M. migrans migrans Black Kite	0	2
Falco biarmicus Lanner	2	4
F. cuvieri African Hobby	0	1
F. subbuteo Hobby	1	4
Polihierax semitorquatus Pigmy Falcon	0	1
Coturnix coturnix Quail	0	1
C. delegorguei Harlequin Quail	2	11
Francolinus coqui Coqui Francolin	1	1
F. sephaena Crested Francolin	1	1
Fulica cristata Red-knobbed or Crested Coot	0	16
Gallinula chloropus Moorhen	0	1
Limnocorax flavirostra Black Crake	1	1
Porphyrio porphyrio Purple Gallinule	0	2
Porzana porzana Spotted Crake	1	1
Sarothrura elegans Buff-spotted Crake	1	1
S. pulchra White-spotted Crake	3	3
Charadrius asiaticus Caspian Plover	0	1
C. dubius Little Ringed Plover	0	19
C. hiaticula Ringed Plover	18	104
C. leschenaultii Great Sand Plover	0	9
C. marginatus White-fronted Sand Plover	1	1
C. mongolus Mongolian Sand Plover	1	6
C. pallidus Chestnut-banded Sand Plover	0	100
C. pecuarius Kittlitz's Sand Plover	25	217
C. tricollaris Three-banded Plover	17	55
Vanellus armatus Blacksmith Plover	30	174
V. coronatus Crowned Lapwing	2	4
V. spinosus Spurwing Plover	2	16
Dromas ardeola Crab Plover	0	2
Cursorius chalcopterus Violet-tipped Courser	0	1
Glareola pratincola Pratincole	0	1
Actophilornis africana Jacana	0	1
Larus cirrocephalus Grey-headed Gull	1	5
Sterna dougallii Roseate Tern	28	28
S. hirundo Common Tern	1	1
S. leucoptera White-winged Black Tern	105	211
S. nilotica Gull-billed Tern	1	7
S. repressa White-cheeked Tern	3	3
Phalaropus lobatus Red-necked Phalarope	2	2

Palearctic Migrants in Bold Type	1970/71	Grand Total
Himantopus himantopus Black-winged Stilt	45	71
Recurvirostra avosetta Avocet	0	6
Rhynchops flavirostris African Skimmer	1	1
Rostratula benghalensis Painted Snipe	3	19
Arenaria interpres Turnstone	0	1
Calidris alba Sanderling	0	1
C. ferruginea Curlew Sandpiper	107	266
C. minuta Little Stint	900	3309
C. subminuta Long-toed Stint	0	1
C. temminckii Temminck's Stint	2	12
Gallinago gallinago Snipe	19	71
G. media Great Snipe	41	44
G. nigripennis African Snipe	2	33
G. stenura Pintail Snipe	0	1
Limosa limosa Black-tailed Godwit	1	1
Numenius phaeopus Whimbrel	1	1
Philomachus pugnax Ruff	818	2683
Tringa erythropus Spotted Redshank	0	1
T. glareola Wood Sandpiper	80	505
T. hypoleucos Common Sandpiper	40	170
T. nebularia Greenshank	2	9
T. ochropus Green Sandpiper	23	38
T. stagnatilis Marsh Sandpiper	188	568
T. terek Terek Sandpiper	2	6
Oena capensis Namaqua Dove	2	5
Streptopelia capicola Ring-necked Dove	31	59
S. decipiens Mourning Dove	3	20
S. lugens Pink-breasted Dove	1	1
S. semitorquata Red-eyed Dove	2	8
S. senegalensis Laughing Dove	53	65
Turtur abyssinicus Black-billed Blue-spotted Wood Dove	1	2
T. afer Blue-spotted Wood Dove	33	82
T. chalcospilos Emerald-spotted Wood Dove	11	34
T. tympanistria Tambourine Dove	16	42
Centropus superciliosus White-browed Coucal	6	10
Ceuthmochares aereus Yellow-bill	1	1
Chrysococcyx caprius Didric Cuckoo	20	35
C. cupreus Emerald Cuckoo	2	3
C. klaas Klaas' Cuckoo	16	24
Clamator jacobinus Black and White Cuckoo	2	2
C. levaillantii Levaillant's Cuckoo	1	1
Cuculus canorus Cuckoo	1	1
C. clamosus Black Cuckoo	1	1
C. solitarius Red-chested Cuckoo	2	2
Tauraco hartlaubi Hartlaub's Turaco	0	2
Ciccaba woodfordii African Wood Owl	1	3
Glaucidium tephronotum Red-chested Owlet	0	1
Otus scops Scops Owl	1	1
Tyto alba Barn Owl	0	1
Caprimulgus europaeus Nightjar	1	1
C. fossii Gabon Nightjar	2	9
C. fraenatus Dusky Nightjar	0	1
C. inornatus Plain Nightjar	1	1
C. pectoralis Fiery-necked Nightjar	1	1
C. poliocephalus Abyssinian Nightjar	2	3
Macrodipteryx longipennis Standard-wing Nightjar	0	1
Apus affinis Little Swift	0	162
A. caffer White-rumped Swift	0	4
Colius macrourus Blue-naped Mousebird	32	80
C. striatus Speckled Mousebird	25	180
Alcedo cristata Malachite Kingfisher	0	68
Ceryle rudis Pied Kingfisher	106	140
Ceyx picta Pigmy Kingfisher	126	251
Halcyon albiventris Brown-hooded Kingfisher	3	4
H. chelicuti Striped Kingfisher	2	9
H. leucocephala Grey-headed Kingfisher	12	21
H. malimbica Blue-breasted Kingfisher	9	9

Palearctic Migrants in Bold Type	1970/71	Grand Total
H. senegalensis Northern Woodland Kingfisher	9	19
H. senegaloides Mangrove Kingfisher	1	1
Tockus erythrorhynchus Red-billed Hornbill	0	1
Coracias caudata Lilac-chested Roller	0	1
C. garrulus Roller	1	2
Merops albicollis White-throated Bee-Eater	19	32
M. apiaster Bee-Eater	0	1
M. bullockoides White-fronted Bee-Eater	0	6
M. oreobates Cinnamon-chested Bee-Eater	3	3
M. pusillus Little Bee-Eater	1	10
M. superciliosus persicus Blue-cheeked Bee-Eater	0	3
M. variegatus Blue-breasted Bee-Eater	11	14
Phoeniculus cyanomelas Scimitar-Bill	4	7
P. minor Abyssinian Scimitar-Bill	5	7
Upupa epops africana African Hoopoe	3	3
U. epops epops Hoopoe	0	1
Buccanodon duchaillui Yellow-spotted Barbet	2	2
B. leucotis White-eared Barbet	1	1
B. olivaceum Green Barbet	0	6
Gymnobucco bonapartei Grey-throated Barbet	0	2
Lybius bidentatus Double-toothed Barbet	6	18
L. guifsobalito Black-billed Barbet	2	7
L. lacrymosus Spotted-flanked Barbet	27	71
L. leucocephalus White-headed Barbet	1	10
L. leucomelas Red-fronted Barbet	16	28
L. melanocephalus Brown-throated Barbet	0	1
L. torquatus Black-collared Barbet	2	2
Pogoniulus bilineatus Golden-rumped Tinker-Bird	15	31
P. chrysoconus Yellow-fronted Tinker-Bird	7	36
P. leucomystax Moustached Green Tinker-Bird	0	1
P. pusillus Red-fronted Tinker-Bird	1	4
Trachyphonus darnaudii d'Arnaud's Barbet	8	23
T. erythrocephalus Red and Yellow Barbet	0	1
T. purpuratus Yellow-billed Barbet	0	6
Indicator conirostris Thick-billed Honey-Guide	1	1
I. exilis Least Honey-Guide	1	1
I. indicator Black-throated Honey-Guide	1	13
I. minor Lesser Honey-Guide	7	30
I. variegatus Scaly-throated Honey-Guide	1	3
Prodotiscus regulus Wahlberg's Honey-Guide	1	1
Campethera cailliautii Little Spotted Woodpecker	3	4
C. caroli Brown-eared Woodpecker	2	2
C. nivosa Buff-spotted Woodpecker	2	5
C. nubica Nubian Woodpecker	2	14
Dendropicos fuscescens Cardinal Woodpecker	6	16
D. poecilolaemus Uganda Spotted Woodpecker	0	1
Jynx torquilla Wryneck	1	2
Mesopicos goertae Grey Woodpecker	4	12
Calandrella cinerea Red-capped Lark	0	1
Eremopterix leucopareia Fischer's Sparrow Lark	0	1
Mirafra africana Rufous-naped Lark	0	4
M. rufocinnamomea Flappet Lark	8	15
Campephaga phoenicea Black Cuckoo-shrike	9	19
C. quiscalina Purple-throated Cuckoo-Shrike	3	3
Dicrurus adsimilis Drongo	2	8
D. ludwigii Square-tailed Drongo	0	1
Emberiza flaviventris Golden-breasted Bunting	6	11
E. tahapisi Cinnamon-breasted Rock Bunting	3	5
Amandava subflava Zebra Waxbill	29	30
Clytospiza monteiri Brown Twinspot	3	25
Cryptospiza jacksoni Dusky Crimson-wing	0	2
C. salvadorii Abyssinian Crimson-wing	19	57
C. shelleyi Shelley's Crimson-wing	0	1
Estrilda astrild Waxbill	43	169
E. atricapilla Black-headed Waxbill	0	1
E. bengala Red-cheeked Cordon-bleau	40	119

Palearctic Migrants in Bold Type	1970/71	Grand Total
E. cyanocephala Blue-headed Cordon-bleau	0	10
E. erythronotos Black-cheeked Waxbill	7	17
E. ianthinogaster Purple Grenadier	16	36
E. melanotis Yellow-bellied Waxbill	4	18
E. nonnula Black-crowned Waxbill	14	17
E. paludicola Fawn-breasted Waxbill	1	32
E. rhodopyga Crimson-rumped Waxbill	12	37
E. troglodytes Black-rumped Waxbill	0	1
Hypargos nitidulus Green-backed Twin-spot	3	3
H. niveoguttatus Peters' Twin-spot	2	3
Lagonosticta rhodopyreia Jameson's Firefinch	6	6
L. rubricata African Firefinch	19	26
L. rufopicta Bar-breasted Firefinch	3	29
L. senegala Red-billed Firefinch	115	314
Lonchura bicolor Rufous-backed Mannikin	8	20
L. cucullatus Bronze Mannikin	60	272
L. griseicapilla Grey-headed Silverbill	0	3
Nigrita canicapilla Grey-headed Negro Finch	5	14
Ortygospiza atricollis Quail Finch	0	2
Pirenestes ostrinus Black-billed Seed-cracker	1	1
Pytelia melba Green-winged Pytilia	35	75
Spermophaga ruficapilla Red-headed Blue-bill	13	42
Vidua chalybeata Purple Indigo-Bird	15	24
V. hypocherina Steel-blue Whydah	0	1
V. macroura Pin-tailed Whydah	13	60
Serinus atrogularis Yellow-rumped Seed-eater	0	88
S. burtoni Thick-billed Seed-eater	4	15
S. canicollis Yellow-crowned Canary	0	18
S. citrinelloides African Citril	15	38
S. dorsostriatus White-bellied Canary	20	80
S. gularis	0	21
S. koliensis Papyrus Canary	9	46
S. mozambicus Yellow-fronted Canary	24	121
S. striolatus Streaky Seed-eater	50	137
S. sulphuratus Brimstone Canary	62	101
Delichon urbica House Martin	9	27
Hirundo abyssinica Striped Swallow	622	1066
H. angolensis Angola Swallow	42	155
H. daurica Red-rumped Swallow	142	444
H. fuligula African Rock Martin	10	17
H. griseopyga Grey-rumped Swallow	0	4
H. rustica Swallow	2770	6029
H. semirufa Rufous-chested Swallow	3	9
H. senegalensis Mosque Swallow	0	2
H. smithii Wire-tailed Swallow	40	160
Psalidoprocne albiceps White-headed Rough-wing	28	70
P. pristoptera Black Rough-wing	3	35
Riparia cincta Banded Martin	16	478
R. paludicola African Sand Martin	299	1353
R. riparia Sand Martin	99	1133
Dryoscopus cubla Black-backed Puff-back Shrike	9	12
D. gambensis Puff-back Shrike	3	12
Eurocephalus anguitimens White-crowned Shrike	0	1
Laniarius barbarus Black-headed Gonolek	21	65
L. ferrugineus Tropical Boubou	4	25
L. funebris Slate-coloured Boubou	22	26
L. luehderi Lühder's Bush Shrike	1	11
L. mufumbiri Papyrus Gonolek	0	1
Lanius collaris Fiscal	16	56
L. collurio sspp. Red-backed and Red-tailed Shrikes	46	152
L. excubitorius Grey-backed Fiscal	2	11
L. mackinnoni Mackinnon's Shrike	1	1
L. minor Lesser Grey Shrike	0	2
L. senator Woodchat Shrike	0	1
Malaconotus blanchoti Grey-headed Bush Shrike	1	1
M. dohertyi Doherty's Bush Shrike	0	2
M. sulfureopectus Sulphur-breasted Bush Shrike	4	13

Palearctic Migrants in Bold Type	1970/71	Grand Total
Nilaus afer Northen Brubru	1	5
Prionops plumata Curly-crested Helmet-Shrike	0	3
Tchagra australis Brown-headed Bush Shrike	6	44
T. jamesi Three-streaked Bush Shrike	1	2
T. minuta Black-cap Bush Shrike	4	27
T. senegala Black-headed Bush Shrike	7	30
Anthus cervinus Red-throated Pipit	0	23
A. leucophrys Plain-backed Pipit	3	16
A. novaeseelandiae Richard's Pipit	53	88
A. trivialis Tree Pipit	24	144
Macronyx croceus Yellow-throated Longclaw	8	21
Motacilla alba alba White Wagtail	0	5
M. alba vidua African Pied Wagtail	26	169
M. capensis Cape Wagtail	0	3
M. cinerea Grey Wagtail	0	2
M. clara Mountain Wagtail	0	3
M. flava Yellow Wagtail	3463	24132
Batis capensis Puff-back Flycatcher	1	3
B. minor Black-headed Puff-back Flycatcher	12	30
B. molitor Chin-spot Puff-back Flycatcher	6	16
B. soror Mozambique Puff-back Flycatcher	3	3
Bradornis microrhynchus Grey Flycatcher	18	23
B. pallidus Pale Flycatcher	0	2
Empidornis semipartitus Silver Bird	0	2
Ficedula hypoleuca Pied Flycatcher	2	2
Hyliota flavigaster Yellow-bellied Flycatcher	0	1
Melaenornis chocolatina White-eyed Slaty Flycatcher	4	31
M. edolioides Black Flycatcher	14	35
Muscicapa adusta Dusky Flycatcher	4	12
M. aquatica Swamp Flycatcher	1	12
M. caerulescens Ashy Flycatcher	1	4
M. griseigularis Grey-throated Flycatcher	3	3
M. striata Spotted Flycatcher	17	44
Myioparus plumbeus Grey Tit-Flycatcher	0	3
Platysteira blissetti Jameson's Wattle-Eye	2	30
P. castanea Chestnut Wattle-Eye	3	13
P. cyanea Wattle-Eye	41	71
P. peltata Black-throated Wattle-Eye	0	12
Terpsiphone rufiventer Black-headed Paradise Flycatcher	1	2
T. viridis Paradise Flycatcher	23	62
Trochocercus albonotatus White-tailed Crested Flycatcher	1	9
T. longicauda Blue Flycatcher	8	13
T. nigromitratus	0	20
Acrocephalus arundinaceus arundinaceus / **A. arundinaceus zarudnyi** } Great Reed Warbler	34	66
A. arundinaceus griseldis Basra Reed Warbler	0	4
A. boeticatus African Reed Warbler	2	7
A. gracilirostris Lesser Swamp Warbler	13	31
A. palustris Marsh Warbler	16	50
A. rufescens Greater Swamp Warbler	5	26
A. schoenobaenus Sedge Warbler	152	443
A. scirpaceus Reed Warbler	237	656
Apalis cinerea Grey Apalis	1	2
A. flavida Black-breasted Apalis	14	20
A. pulchella Buff-bellied Warbler	4	11
A. pulchra Black-collared Apalis	5	17
Bathmocercus cerviniventris Black-faced Rufous Warbler	7	42
Bradypterus baboecala Little Rush Warbler	1	2
B. barratti Evergreen Forest Warbler	0	3
B. cinnamomeus Cinnamon Bracken Warbler	0	17
B. graueri carpalis White-winged Warbler	0	5
Camaroptera brachyura Grey-backed Camaroptera	119	269
C. chloronota Olive-green Camaroptera	2	37
C. simplex Grey Wren-Warbler	9	12
Chloropeta natalensis Yellow Flycatcher-Warbler	16	20
C. similis Mountain Yellow Flycatcher-Warbler	0	15
Cisticola brachyptera Siffling Cisticola	0	1

Palearctic Migrants in Bold Type	1970/71	Grand Total
C. brunnescens Pectoral-patch Cisticola	2	3
C. cantans Singing Cisticola	18	24
C. carruthersi Carruthers' Cisticola	0	15
C. chiniana Rattling Cisticola	28	35
C. erythrops Red-faced Cisticola	41	60
C. galactotes Winding Cisticola	154	241
C. hunteri Hunter's Cisticola	9	23
C. juncidis Zitting Cisticola	8	9
C. lateralis Whistling Cisticola	0	3
C. natalensis Croaking Cisticola	3	26
C. robusta Stout Cisticola	8	34
C. woosnami Trilling Cisticola	6	10
Eminia lepida Grey-capped Warbler	34	99
Eremomela icteropygialis Yellow-bellied Eremomela	2	6
Hippolais icterina Icterine Warbler	0	3
H. languida Upcher's Warbler	5	7
H. olivetorum Olive-tree Warbler	0	1
H. pallida Olivaceous Warbler	25	50
Hylia prasina Green Hylia	13	18
Locustella fluviatilis River Warbler	2	7
Phylloscopus budongoensis Uganda Woodland Warbler	0	2
P. collybita Chiff-chaff	1	1
P. trochilus Willow Warbler	1029	1648
P. umbrovirens Brown Woodland Warbler	1	31
Prinia bairdii Banded Prinia	1	16
P. leucopogon White-chinned Prinia	13	36
P. subflava Tawny-flanked Prinia	56	110
Schoenicola platyura Fan-tailed Warbler	0	1
Sphenoeacus mentalis Moustache Warbler	6	7
Sylvia atricapilla Blackcap	17	150
S. borin Garden Warbler	145	893
S. communis Whitethroat	74	108
S. nisoria Barred Warbler	16	25
Sylvietta brachyura Crombec	5	18
S. leucophrys White-browed Crombec	1	5
S. whytii Red-faced Crombec	19	37
Alcippe abyssinica Abyssinian Hill Babbler	4	27
Trichastoma albipecta Scaly-breasted Illadopsis	2	26
T. fulvescens Brown Illadopsis	9	19
T. poliothorax Grey-chested Illadopsis	3	3
T. pyrrhoptera Mountain Illadopsis	0	5
T. rufipennis Pale-breasted Illadopsis	6	27
Turdoides hypoleucos Northern Pied Babbler	2	2
T. jardinei Arrow-marked Babbler	4	11
T. melanops Black-lored Babbler	1	7
T. plebejus Brown Babbler	5	44
T. rubiginosus Rufous Chatterer	13	14
Alethe poliocephala Brown-chested Alethe	26	76
A. poliophrys Red-throated Alethe	0	1
Cercomela sordida Hill Chat	0	7
Cercotrichas hartlaubi Brown-backed Scrub-Robin	0	6
C. leucophrys Red-backed Scrub-Robin	42	81
C. quadrivirgata Eastern Bearded Scrub-Robin	2	7
Cichladusa guttata Spotted Morning Warbler	3	3
Cossypha archeri Archer's Robin Chat	0	1
C. caffra Robin Chat	12	46
C. cyanocampter Blue-shouldered Robin Chat	2	14
C. heuglini White-browed Robin Chat	44	151
C. natalensis Red-capped Robin Chat	6	43
C. niveicapilla Snowy-headed Robin Chat	9	33
C. polioptera Grey-winged Robin Chat	2	9
C. semirufa Rüppell's Robin Chat	3	8
Irania gutturalis White-throated Robin	3	3
Luscinia luscinia Sprosser	24	39
L. megarhynchos Nightingale	7	14
Monticola rufocinerea Little Rock Thrush	0	2
M. saxatilis Rock Thrush	10	24

Palearctic Migrants in Bold Type	1970/71	Grand Total
Myrmecocichla nigra Sooty Chat	9	10
Neocossyphus poensis White-tailed Ant Thrush	5	8
Oenanthe isabellina Isabeline Wheatear	1	6
O. oenanthe Wheatear	13	37
O. pileata Capped Wheatear	0	1
O. pleschanka Pied Wheatear	3	5
Phoenicurus phoenicurus Redstart	9	48
Pogonocichla stellata White-starred Bush Robin	6	58
Saxicola rubetra Whinchat	7	67
Saxicola torquata Stonechat	9	14
Sheppardia aequatorialis Equatorial Akalat	17	59
Stizorhina fraseri Rufous Flycatcher	7	7
Turdus abyssinicus Olive Thrush	1	109
T. pelios African Thrush	14	38
T. piaggiae Abyssinian Ground Thrush	1	6
Anthreptes collaris Collared Sunbird	8	33
A. longuemarei Uganda Violet-backed Sunbird	0	4
A. orientalis Violet-backed Sunbird	0	4
A. rectirostris Green Sunbird	1	1
Nectarinia alinae Blue-headed Sunbird	0	7
N. amethystina Amethyst Sunbird	0	1
N. bifasciata Little Purple Banded Sunbird	16	53
N. bouvieri Orange-tufted Sunbird	1	1
N. chloropygia Olive-bellied Sunbird	7	12
N. cuprea Copper Sunbird	40	139
N. erythroceria Red-chested Sunbird	202	393
N. famosa Malachite Sunbird	0	1
N. kilimensis Bronze Sunbird	28	93
N. mariquensis Mariqua Sunbird	14	119
N. mediocris Eastern Double-collared Sunbird	41	80
N. olivacca Olive Sunbird	44	105
N. preussi Northern Double-collared Sunbird	3	32
N. pulchella Beautiful Sunbird	15	103
N. regia Regal Sunbird	0	2
N. reichenowi Golden-winged Sunbird	5	8
N. senegalensis Scarlet-chested Sunbird	43	131
N. tacazze Tacazze Sunbird	0	38
N. venusta Variable Sunbird	42	75
N. verticalis Green-headed Sunbird	13	55
Oriolus brachyrhynchus Western Black-headed Oriole	2	2
O. larvatus Black-headed Oriole	0	2
O. oriolus Golden Oriole	5	9
Parus albiventris White-bellied Tit	2	9
P. fringillinus Red-faced Tit	6	6
Remiz caroli African Penduline Tit	1	1
Passer eminibey Chestnut Sparrow	8	20
P. griseus Grey-headed Sparrow	58	166
P. iagoensis Rufous Sparrow	1	6
Petronia xanthocollis Yellow-spotted Petronia	1	11
Plocepasser donaldsoni Donaldson-Smith's Sparrow-Weaver	0	5
P. mahali Stripe-breasted Sparrow-Weaver	4	24
Sporopipes frontalis Speckle-fronted Weaver	6	8
Amblyospiza albifrons Grosbeak Weaver	1	8
Anomalospiza imberbis Parasitic Weaver	81	91
Euplectes afra Yellow-crowned Bishop	1	1
E. albonotatus White-winged Widow Bird	33	129
E. ardens Red-collared Widow Bird	5	56
E. axillaris Fan-tailed Widow Bird	99	321
E. capensis Yellow Bishop	0	1
E. gierowii Black Bishop	3	28
E. hordeaceus Black-winged Red Bishop	3	41
E. jacksoni Jackson's Widow Bird	0	3
E. macrourus Yellow-mantled Widow Bird	0	18
E. orix Red Bishop	6	17
Malimbus rubriceps Red-headed Weaver	1	2
M. rubricollis Red-headed Malimbe	2	2

Palearctic Migrants in Bold Type	1970/71	Grand Total
Ploceus alienus Strange Weaver	0	2
P. aurantius Orange Weaver	8	8
P. baglafecht Baglafecht Weaver	46	233
P. bicolor Dark-backed Weaver	3	4
P. bojeri Golden Palm Weaver	0	1
P. castanops Northern Brown-throated Weaver	3	85
P. cucullatus Black-headed Weaver	175	510
P. intermedius Masked Weaver	155	326
P. jacksoni Golden-backed Weaver	47	362
P. luteolus Little Weaver	9	28
P. melanocephalus Yellow-backed Weaver	266	1209
P. melanogaster Black-billed Weaver	1	11
P. nigerrimus Vieillot's Black Weaver	53	62
P. nigricollis Black-necked Weaver	31	39
P. ocularis Spectacled Weaver	69	187
P. pelzelni Slender-billed Weaver	57	340
P. rubiginosus Chestnut Weaver	22	25
P. spekei Speke's Weaver	27	121
P. subaureus Golden Weaver	2	2
P. superciliosus Compact Weaver	0	13
P. velatus Vitelline Masked Weaver	0	5
P. weynsi Weyns' Weaver	17	17
P. xanthops Holub's Golden Weaver	8	35
Quelea cardinalis Cardinal Quelea	41	119
Q. erythrops Red-headed Quelea	12	85
Q. quelea Red-billed Quelea	132	330
Andropadus ansorgei Ansorge's Greenbul	3	3
A. curvirostris Cameroon Sombre Greenbul	11	30
A. gracilirostris Slender-billed Greenbul	1	1
A. importunus Zanzibar Sombre Greenbul	6	18
A. latirostris Yellow-whiskered Greenbul	77	475
A. milanjensis Stripe-cheeked Greenbul	0	2
A. montanus Shelley's Greenbul	2	11
A. tephrolaemus Olive-breasted Mountain Greenbul	1	77
A. virens Little Greenbul	67	102
Bleda syndactyla Bristle-bill	6	21
Chlorocichla flavicollis Yellow-throated Leaflove	14	46
C. flaviventris Yellow-bellied Greenbul	1	8
Nicator chloris Nicator	3	3
Phyllastrephus albigularis White-throated Greenbul	24	24
P. baumanni Toro Olive Greenbul	0	8
P. debilis Smaller Yellow-streaked Greenbul	0	3
P. fischeri Fischer's Greenbul	10	70
P. strepitans Northern Brownbul	4	11
P. terrestris Brownbul	0	7
Pycnonotus barbatus Dark-capped or Yellow-vented Bulbul	355	1617
Buphagus erythrorhynchus Red-billed Oxpecker	0	2
Cinnyricinclus leucogaster Violet-backed Starling	1	37
Creatophora cinerea Wattled Starling	10	39
Lamprotornis caudatus Rüppell's Long-tailed Glossy Starling	5	13
L. chalybaeus Blue-eared Glossy Starling	2	6
L. chloropterus Lesser Blue-eared Glossy Starling	0	2
L. corruscus Black-breasted Glossy Starling	4	4
Spreo hildebrandti Hildebrandt's Starling	16	17
Spreo superbus Superb Starling	2	21
Zosterops abyssinica Yellow White-eye	41	64
Z. senegalensis jacksoni Green White-eye	0	92
Z. senegalensis kikuyuensis Kikuyu White-eye	18	65
Z. senegalensis kulalensis Kulal White-eye	0	4
Total Birds Ringed	17437	68256
Total Species Ringed	386	520
Total Palearctic Birds Ringed	10630	44139
Total Palearctic Species Ringed	61	79

TABLE 2

RECOVERIES AND CONTROLS OF BIRDS RINGED IN EAST AFRICA

Key to symbols and terms

Ring number	:		— where this is in italics the ring has been returned.
Age	:	f.g.	— full grown, age uncertain;
		ad.	— adult;
		pull.	— young, not able to fly freely;
		juv.	— juvenile, able to fly freely.
Sex	:	♂	— male;
		♀	— female.
Manner of recovery	:	+	— shot or killed by man;
		×	— found dead or dying;
		xA	— found long dead;
		/?/	— manner of recovery unknown;
		v	— caught or trapped alive and released with ring (control);
		()	— caught or trapped alive and not released, or released with ring removed.
Date of recovery	:		— given in the order: day, month, year. If the date is unknown, the date of the reporting letter is given in parentheses.
Distance (km)	:		— only given for recoveries within East Africa.
Elapsed time	:		— given in the form, years: months: days, thus 1:2:9 signifies 1 year 2 months and 9 days after ringing.

Anas erythrorhynchos Red-billed Duck

Z. 0252	ad.	22. 3.71	Arusha National Park, Tanzania 3°13′S., 36°54′E. JSSB.
	+	4. 4.71	Salt Pans, Dutch Corner, Sanya Juu, Tanzania 3°09′S., 37°01′E., *c.* 15km NE, 0:0:14. Miss J. Goodman.
Z. 0258	ad.	22. 3.71	ringing and recovery details as above.
Z. 0259	ad.	22. 3.71	Arusha National Park, Tanzania. JSSB.
	+	24. 5.71	Ngaserai Controlled Area, Tanzania, just outside the Park boundary, 0:2:3. R.E. Redhead.

Anas hottentota Hottentot Teal

D. 0918	ad.	23.11.68	Lake Nakuru, Kenya 0°20′S., 36°06′E. GCB.
	+	30. 9.71	Ol Bolossat, Kenya 0° 09′S., 36°26′E., 45km NE, 2:10:8. Mr. Baxendale.
D.0945	f.g.	2. 2.69	Lake Nakuru, Kenya. GCB.
	+	13. 2.71	Ol Bolossat, Kenya, 45km NE, 2:0:11. J. R. Northern.

Anas undulata Yellow-billed Duck

D. 1191	f.g.	7. 2.71	Kaptagat, Kenya 0°26′N., 35°29′E. CFM.
	+	28. 3.71	Kaptagat, 0:1:21. M. P. B. G. Wilson.

Philomachus pugnax Ruff

B. 2920	f.g.♀	1. 1.69	Naivasha, Kenya 0°43′S., 36°25′E. GCB.
	v	24 1.71	Lake Nakuru, Kenya, 58km NW, 2:0:23. DJP.
C.1760	ad.♂	4. 4.69	Naivasha, Kenya. GCB.
	+	5. 6.71	*near* Dudinka, Krasnoyarskii Territory, **U.S.S.R.** 69°24′N., 80°17′E., 2:2:1. (Ringing Centre, Moscow)
B.4166	ad.♀	10. 5.70	Lake Nakuru, Kenya. GCB.
	+	15. 4.71	*near* Nadym, Tyumen Region, **U.S.S.R.** 65°37′N., 72°48′E., 0:11:5. (Ringing centre, Moscow)
B.7853	f.g.♀	16. 1.71	Lake Nakuru, Kenya. PLB.
	v	27. 4.71	Lake Hannington, Kenya 0°15′N., 36°06′E., *c.*65km N, 0:3:11. T. J. Barnley.
	v	16.10.71	Lake Nakuru, Kenya, 0:5:19. DJP.

B.7162	1stW.♀	22. 2.71	Lake Nakuru, Kenya. DJP.
	+	20. 5.71	*near* Surgut, Tyumen Region, **U.S.S.R.** 61°18′N., 73°22′E., 0:2:22. (Ringing Centre, Moscow)

Tringa glareola Wood Sandpiper

B. 1980	f.g.	21.10.68	Lake Nakuru, Kenya. GCB.
	caught?	11. 7.71	*near* Turinskaya Sloboda, **U.S.S.R.** 57°38′N., 64°27′E., 2:8:20. (Ringing Centre, Moscow)

Colius striatus Speckled Mousebird

A.12606	ad.	8. 5.71	Dar es Salaam, Tanzania 6°48′S., 39°17′E. WGH.
	+	19. 8.71	Dar es Salaam, 0:3:11. This bird was killed by a child using a catapult; on dissection by WGH it was found to contain three half-formed eggs.

Hirundo abyssinica Striped Swallow

J.37822	ad.	12. 7.70	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	×	2. 4.71	Mbagathi, Nairobi 1°23′S., 36°46′E., 20km SW. 0:8:20. S. Kanyingi.
J.37880	juv.	19. 7.70	Kariobangi, Nairobi, Kenya. GCB.
	"v"	7. 5.71	Muthaiga, Nairobi 1°15′S., 36°50′E., 4.5 km NW. 0:9:18. This bird was temporarily stunned by a golf ball. R. C. Soper.

Hirundo rustica Swallow

J. 19385	juv.	12.12.68	Lake Nakuru, Kenya. PLB & JFH.
	?×	13. 9.70	*near* Gul'kevichi, Krasnodarskii Territory, **U.S.S.R.** 45°21′N., 40°40′E., 1:9:1. (Ringing Centre, Moscow)
J.26543	juv.	11. 2.69	Muko, Uganda 0°28′S., 30°44′E., HR & W.
	×	(13.8.71)	Petrijevci, *near* Osijek, **Yugoslavia** *c.* 45°33′N., 18°42′E., 2:6:0. L. Lukic.
J. 32781	ad.♀	19.12.69	Lake Nakuru, Kenya. JFH.
	v	3. 4.71	Athi River, Kenya 1°26′S., 36°59′E., 160km SE, 1:3:14. GCB.
J.26912	1st W.	26.12.69	Mweya, Queen Elizabeth Park, Uganda 0°11′S., 29°54′E. MPLF.
	?×	18. 5.70	*near* Nakhichevan', Azerbaidzhan S.S.R., **U.S.S.R.** 39°14′N., 45°25′E., 0:4:12. (Ringing Centre, Moscow)
J.39531	ad.♀	11. 1.70	Ruhengere, Uganda 0°26′S., 30°45′E. HR & W.
	?×	27. 7.71	*near* Oktyabr'skii, Volgograd Region, **U.S.S.R.** 47°58′N., 43°40′E., 1:6:16. (Ringing Centre, Moscow)
J.39538	juv.	11. 1.70	Ruhengere, Uganda. HR & W
	/?/	22. 7.71	*near* Maikop, Krasnodarskii Territory, **U.S.S.R.** 44°35′N., 40° 08′E., 1:6:11. (Ringing Centre, Moscow)

(It is interesting to note that Swallow No. J39539, also ringed at Ruhengere on 11.1.70, was controlled in Czechoslovakia on 19.5.70, see Backhurst 1971.)

J.37100	juv.	20.1.70	Athi River, Kenya. GCB.
	v	30. 4.71	Chokpak Pass, Eastern Kazakhstan, **U.S.S.R.** 42°31′N., 70° 38′E., 1:3:10. E. I. Gavrilov. *Moskwa* K-028405 added.
J.37200	juv.	29. 1.70	Lake Nakuru, Kenya. GCB.
	v	6. 1.71	Kariobangi, Nairobi, Kenya, 135 km SE, 0:11:7. DJP.
J.2186	ad.♂	21.11.70	Ruhengere, Uganda. HR & W.
	/?/	15. 5.71	*near* Kurganinsk, Krasnodarskii Territory, **U.S.S.R.** 44°54′N., 40° 34′E., 0:5:24. (Ringing Centre, Moscow)
J.39755	juv.	29.12.70	Muko, Uganda. HR & W.
	×(*car*)	(29.3.71)	25 km E of Mbarara, Uganda, *c.* 8 km ESE, *c.* 0:3:0. B. N. Musoke.
J. 51708	f.g.	27. 3.71	Kibebe Farm, Iringa, Tanzania 7°46′S., 35°42′E. JFR.
	×	14. 5.71	*near* Dzhuma, Samarkand Region, Uzbek S.S.R., **U.S.S.R.**, 39°42′N., 66°40′E., 0:1:19. (Ringing Centre, Moscow)

Motacilla flava **Yellow Wagtail**

J.3256	f.g.♀	17.11.66	Kaazi, *near* Kampala, Uganda 0°12′N., 32°37′E. DJP.
	/?/	(24.11.71)	Kibengo Village, Bombo, Uganda *c.* 0°36′N., 32°33′E., *c.* 40 kmN, *c.* 5:0:0. K. Omudeke.
J.5586	f.g.	11.2.67	Thika, Kenya 1°03′S., 37°05′E. DJMC.
	v(ad.♀)	20.10.71	Kariobangi, Nairobi, 35 km SW. 4:8:9. DJP.
J.11615	ad.♂ (*flava*)	16. 1.68	Kabete, Kenya (at roost) 1°16′S., 36°43′E. EDS.
	×	15. 7.71	*near* Kurganinsk, Chuvash A.S.S.R., **U.S.S.R.,** 55°52′N., 47° 27′E., 3:5:29. (Ringing Centre, Moscow)
J. 21789	f.g.♀	1.11.68	Kariobangi, Nairobi, Kenya. GCB.
	×	0. 6.71	*near* Dergachi, Saratov Region, **U.S.S.R.** 51°13′N., 49°05′E., *c.* 2:7:0. (Ringing Centre, Moscow)
J. 22717	f.g.♂ (*flava*)	20. 2.69	Kabete, Kenya (at roost). EDS.
	+	5. 9.71	Arsanjan, 82 km ENE of Shiraz, Fars Province, **Iran** 29°50′N., 53°18′E., 2:6:15. A. Khademolhossein.
J. 13725	f.g.	17. 1.69	Kabete, Kenya (at roost). GCB.
	×	*early* 7.70	*near* Russkii Aktash, Tatar A.S.S.R., **U.S.S.R.** 55°02′N., 52°08′E., *c.* 1:5:17. (Ringing Centre, Moscow)
X.1448	1stW.♂ (*flava*)	9.2.71	Kabete, Kenya (at roost). GCB.
	×	29. 1.72	Karen, Kenya 1°18′S., 36°41′E., 8km S, 0:11:20. C. S. Moore.

Acrocephalus scirpaceus **Reed Warbler**

J.34951	ad.	15. 1.70	Kabete, Kenya. GCB.
	/?/	7. 9.71	Az Zilifi (=Zulfi), **Saudi Arabia** 26°15′N., 44°50′E., 1:7:22. S. Sakran.

Sylvia atricapilla **Blackcap**

J. 19219	f.g.(♂)	20.11.68	Ng'iya, Central Nyanza, Kenya 0°03′N., 34°23′E. PLB & JFH.
	× or +	11. 4.71	*near* Bidkarz, Fars Province, **Iran** 29°55′N., 51°00′E., 2:4:21. Two reporting letters were received concerning this bird, one claimed that it had been found dead, the other that it had been killed by a stone. F. Reeb; D. A. Scott.

Phoenicurus phoenicurus **Redstart**

J. 49030	ad. ♂	6. 3.71	Kachonga, Mbale, Uganda 0°58′N., 34°03′E. JR.
	v	22. 3.71	Kachonga, 0:0:16. JR.
	+	22. 4.71	Al Haditha, **Iraq** 34°09′E., 42°22′E. 0:1:0. Ismail Abdul Hamud Al-Hadithi.

Passer griseus **Grey-headed Sparrow**

A.10515	ad.	12. 9.70	Kibuli, Uganda *c.* 0°19′N., 32°35′E. RF.
	+	20. 7.71	Kibuli, 0:10:8. Shot by catapult, bird eaten. (O. Tikodri).

KEY TO INITIALS IN LIST OF RECOVERIES

GCB	G. C. & D. E. G. Backhurst	WGH	W. G. Harvey
		HR & W	G. N. Harrington, M. Reid & E. R. Waterhouse
JSSB	J. S. S. Beesley	CFM	C. F. Mann
PLB	P.L. & H. A. Britton	DJP	D. J. Pearson
DJMC	D. J. M. Caffyn	JFR	J. F. Reynolds
MPLF	M. P. L. Fodgen	JR	J. Rolf
RF	R. Frankum	EDS	E. D. Steel
JFH	J. F. & L. M. Harper		

OTHER RINGERS IN EAST AFRICA

Denise Angwin	W. P. Langridge
Lise Campbell	N. O. Okia
A. D. Forbes-Watson	Nina Pettitt
J. Goddard	M. StJ. & G. Sugg

Notes.—The above lists do not total 21 as mentioned on page 1; this is because Caffyn, Reid and Steel, although mentioned in the list of recoveries, have left East Africa and were not therefore ringers in 1970-71; further, husband and wife teams are counted as one ringer.

MAP 1:—Showing recoveries of East African-ringed birds reported during 1970-71 to the Palearctic Region.

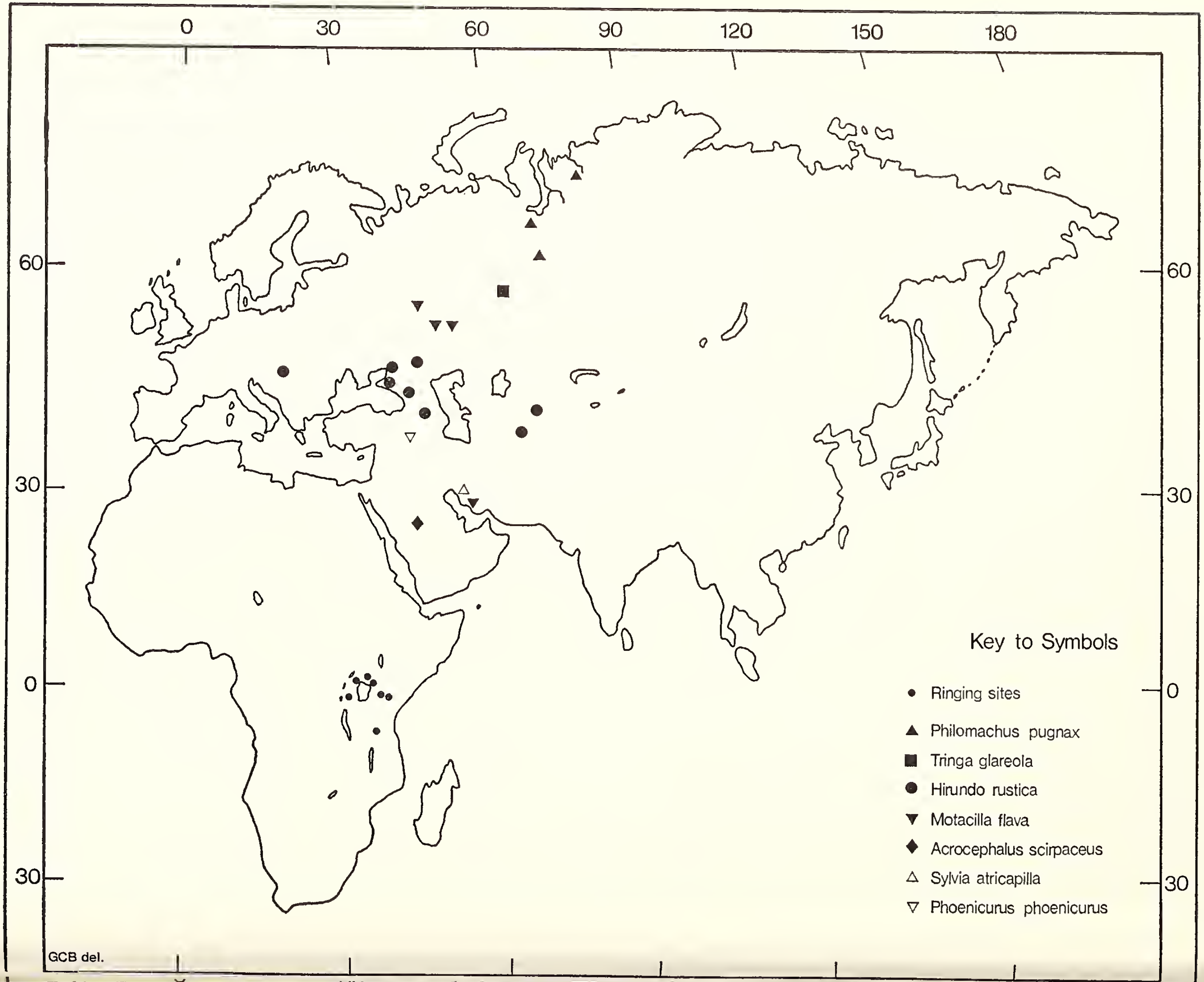

TABLE 3

PALEARCTIC BIRDS RETRAPPED AT ORIGINAL RINGING SITES DURING 1970-71 WHICH WERE RINGED IN PREVIOUS SEASONS

Charadrius hiaticula Ringed Plover	1
Calidris ferruginea Curlew Sandpiper	1
Calidris minuta Little Stint	23
Philomachus pugnax Ruff	24
Tringa glareola Wood Sandpiper	1
Tringa stagnatilis Marsh Sandpiper	2
Hirundo rustica Swallow	7
Motacilla flava Yellow Wagtail	156
Phylloscopus trochilus Willow Warbler	1
Oenanthe oenanthe Wheatear	1

Notes on Table 3

1. The extent to which Palearctic migrants recur in their winter quarters (*Ortstreue*) has been demonstrated only comparatively recently (see, for example, Moreau 1969 and *in press*, De Roo & Deheegher 1969, and Pearson 1972). The above table merely serves to show that the phenomenon occurs between Eurasia and East Africa; no quantitative conclusions should be drawn from the data given, and, for this reason, no ringing totals are given in the table. This statement may need some explanation: if Jackson (1938) had ringed his bread and cake-eating Yellow Wagtail in April 1915 at Entebbe he would have achieved a 100 per cent return to winter quarters in October of that year when the bird came back. If, on the other hand he had managed to ring a single Swallow or Sand Martin caught while feeding in a flock near Lake Victoria it would have been exceedingly unlikely that the ringed bird would have been detected or found in a subsequent year, although it is quite possible that the individual Swallow or Sand Martin *had* returned to the same area. Thus the correct interpretation of *Ortstreue* data cannot be assessed without (a) full knowledge of the ringing picture at a given locality and (b) full knowledge of the trapping effort expended at that locality in subsequent seasons. It follows (giving an extreme example) that if 1000 migrants are ringed at a locality one season from, say, December to March none will be retrapped the following season if no trapping is done there, giving a "nil" return to winter quarters. It is likely however that if trapping is resumed the next season (i.e. two years after the 1000 birds were ringed) a number of first-season birds will be caught and this number will depend, apart from mortality and any non-*Ortstreue* element, upon the trapping effort expended in the third season and upon the ease with which the particular birds can be caught. Any computation of percentages of returning birds must take into account the number of birds *handled* in the season in question, and this will include also "same-season" retraps.

From circumstantial evidence it seems likely that most species of which individuals have been retrapped in later seasons are normally true to their winter quarters but, from the figures in Table 3 and from personal knowledge as well, it is not yet possible to compare the extent of this fidelity between species; a final example will serve to illustrate the point: the single Willow Warbler listed in Table 3 was trapped in Napier Grass *Pennisetum purpureum* Schumach. at Kabete at the end of December 1968. In the 1968-69 season only three Willow Warblers were caught at this site. The following season (1969-70) less effort was devoted to the area and no Willow Warblers were caught; however, in the 1970-71 season, despite a rather limited amount of netting effort (but nevertheless more than in 1969-70) four Willow Warblers were caught including a 1968-69 bird. It is considered likely that the small number of this species present in the Napier Grass at the times of netting were winter residents and that the single retrap in 1970-71 suggests that Willow Warblers, albeit on a very small sample, are true to *winter* quarters. The reasons that only one Willow Warbler has ever been retrapped in a subsequent season at the place of ringing are, in the writer's view, that either most are trapped on *passage* (i.e. not in their *winter* quarters), or that the majority of wintering birds ringed have been ringed in areas where less trapping effort has been expended in later seasons. Detailed papers on *Ortstreue* are in the course of preparation.

2. The table does not give a complete summary of birds retrapped in subsequent seasons: one ringer is known to have data on such birds but he is unwilling to part with them.

TABLE 4

RECOVERIES IN EAST AFRICA OF BIRDS RINGED ABROAD

The signs and symbols are the same as those used in Table 2.

Sarkidiornis melanota Knob-billed Goose

Pretoria			
546-12359	ad.♂	15. 5.66.	Mlezu, 150 km ENE of Bulawayo, **Rhodesia** 19°09′S., 29°54′E. H. F. Meyer.
	+	30.11.70	Mwalukwa Dam, Shinyanga. Tanzania *c.* 3°33′S., 33°54′E. 4:6:15. (J. Jonathan)

Buteo buteo Buzzard

Helsinki			
D.33 080	pull.	14. 7.70	Palsina, Kuorevesi, Häme, **Finland** 61°57′N., 24°53′E. H. Mikkola & S. Pynnonen.
	×	*before* 20.11.70	Musoma, Tanzania 1°31′S., 33°48′E. L. Melamari.

Larus fuscus Lesser Black-backed Gull

Helsinki			
H. 67 557	pull.	23. 6.66	Velusmaa, Rymättylä, Turku-Pori, **Finland** 60°23′N., 22° 00′E. K. Hedenström.
	()	autumn 68	Homa Bay, Kenya 00°31′S., 34°30′E. The bird was found alive in a fishing net, its fate is unknown.
Helsinki			
H.97 843	pull.	24. 6.68	Tjusgrund, Kustavi, Turku-Pori, **Finland** 60°37′N., 21°07′E. J. Virtanen.
	×	(3.1.69)	"Lake Victoria", Uganda. Y. Tamal.
Helsinki			
H.104 617	pull.	26. 6.69	Trollö, Pargas, Abo-Björnerborg, **Finland** 60°08′N., 22°15′E, K. Hedenström.
	"caught"	30. 9.69	Teso, Kumi, Uganda, 1°40′N., 33°30′E., 0:3:4. W. Banage.

Hirundo rustica Swallow

Moskwa			
K.0001B4	*age* ?	24.4.70	*near* Chokpak, Dzhambul, Kazakhstan, **U.S.S.R.** 42°31′N., 70°38′E.
	v	5.2.71	Kibebe Farm, Iringa, Tanzania 7°46′S., 35°42′E., 0:9:11. Moscow ring replaced by Nairobi J. 50653. JFR.

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PRELIMINARY CHECKLIST OF LAGOONAL FISHES OF DIANI, KENYA

By

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The area surveyed lies at the northern end of Diani Beach and is intersected, approximately, by 39°35'E longitude and 4°17'S latitude. It forms a rectangle about 1000×500 m, the longer sides being bounded by the shoreline and the outer edge of the reef platform exposed at low-water levels. The lagoon or reef flat is 500 m wide. The southern portion of the shoreline is of fine coral sand, the northern consists of old eroded coral rock subject to seasonal sand movement, which may engulf many of the rocky pools.

Within this area is a great variety of littoral, lagoonal and reef platform habitats; these, diagrammatically illustrated in fig.1, may be summarised briefly as follows:

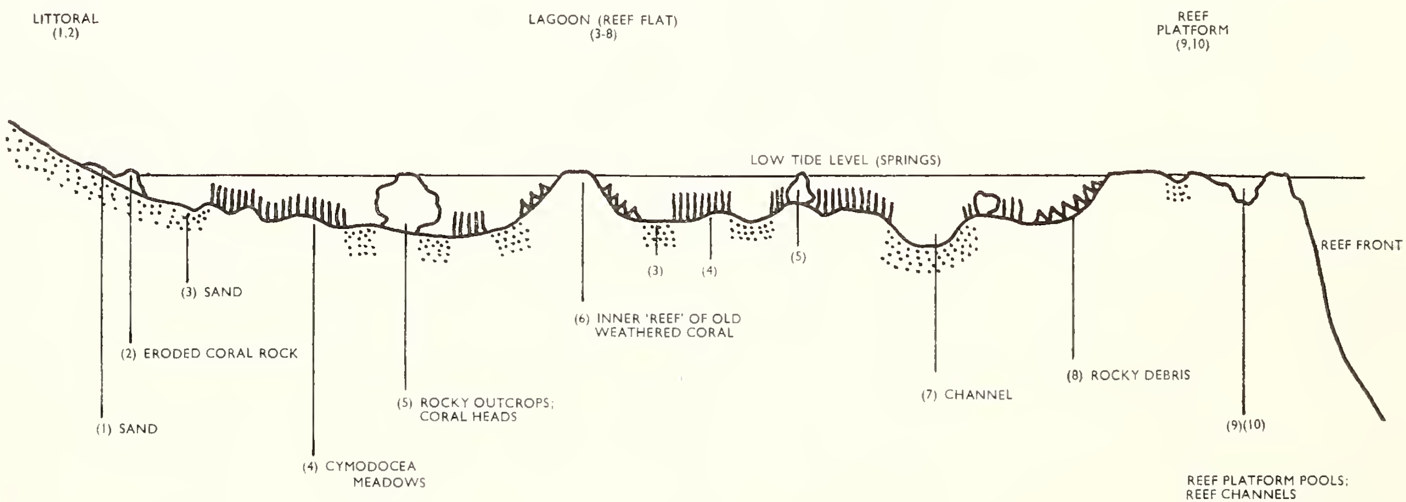
Littoral	(1)	sandy shore
	(2)	rocky shore with associated pools
Lagoonal	(3)	sandy bottom
	(4)	*Cymodocea* and other marine grass meadows
	(5)	rocky outcrops, often with more or less extensive coral growths; coral heads
	(6)	old inner reefs, usually exposed at low tide, surrounded by rock debris
	(7)	channels, draining into reef channels at low tides
	(8)	rocky debris, inshore of reef platform
Reef platform	(9)	pools, of varying size
	(10)	reef channels connecting the lagoon to the sea, known locally as *milango*.

Recordings were made at low tides between November 1970 and February 1971, and again in December 1971, and the list therefore relates more specifically to species present during the north-east monsoon period. About one third of the species listed were caught in small handnets and kept in an aquarium for two or three days while identification was made; they were subsequently returned to their specific habitats. For the remainder, identification was by underwater observation only, and this occasionally presented obvious problems in identity. A question mark in the text indicates where identity of genus or species is open to question.

The Diani lagoon is typical of the shallow type, as opposed to the appreciably deeper lagoon type such as occurs in the Watamu Marine National Park. Consequently, there is an absence of coral gardens, and nowhere is there an abundance of coral growths.

Fig. 1 Diagrammatic cross-section of the lagoon at North Diani

Vertical scale exaggerated. The relative extent of the various ecological zones varies considerably in different transects.



This is significantly reflected by the extreme paucity of species of parrot fish (Callyodontidae) and by the relatively low species density of butterfly fish (Chaetodontidae). In contrast, species of the families Pomacentridae, Labridae and Apogonidae are abundant, which indicates favourable habitats for these.

The checklist can only be described as preliminary: observations were confined to low tides occurring during daylight hours, and no attempt was made to poison pools or lagoonal areas in order to make a complete species census. It is therefore certain that many more species, particularly of such families as the Labridae, Muraenidae, Scorpaenidae, Gobiidae, Salariidae, Blennidae and Eleotridae, will be added. In spite of this, the 137 species catalogued from an area approximately 0.5 square kilometer is indicative of the extremely rich fauna inhabiting the shallow lagoons of the Kenya reef.

In the checklist, the numbers entered subsequent to the species refer to the numbers given to the serially described habitats in which the species was most often observed. Special habitats not referred to above, such as the occurrence of *Amphiprion ephippium* in the sea anemone *Stoichactys*, are referred to individually in the list. Similarly, the letters give an indication of whether the species occurred commonly in moderately high population densities (C); fairly commonly, but generally less abundantly (P); or was encountered infrequently (R).

The author citations for species were taken from Smith & Smith (1963).

CHIROCENTRIDAE
Chirocentrus dorab (Forsk) lagoonal (P)
CLUPEIDAE
Sardinella melanura (Cuv), lagoonal, seasonal, in vast shoals
PLOTOSIDAE
Plotosus arab Blkr, (9, P, juveniles in shoals)
SYNODIDAE
Synodus variagatus Lac, (3, C)
HEMIRAMPHIDAE
Hemiramphus ? far Forsk, surface waters of lagoon (P)
TYLOSURIDAE
Tylosurus crocodilus Les, surface waters of lagoon (C)
HOLOCENTRIDAE
Holocentrus diadema Lac, (5, 9, C)
H. sammara Forsk (5, 9, C)
Myripristis pralinus C+V, (5, 9, C)
SOLEIDAE
Pardachirus marmoratus (Lac) (3, P)
SYNGNATHIDAE
Corythoichthys fasciatus (Gray) (3, 4, 5, C)
AULOSTOMIDAE
Aulostomus valentini Blkr, (5, R)
FISTULARIDAE
Fistularia petimba (Lac) (4, R)
SOLENOSTOMIDAE
Solenostomus ? cyanopterus Bleck, (4, R)
CIRRHITIDAE
Cirrhitichthys aprinus (C+V), (8, R)
Paracirrhites forsteri (Bl-Schn), (8, R)
TERAPONIDAE
Terapon jarbua (Forsk) (2, C)
DULEIDAE
Dules taeniurus C+V, (2, P)
SERRANIDAE
Epinephelus macrospilus (Blkr), (10, R)
E. merra (Bloch), (8, R)
Grammistes sexlineatus (Thunb), (5, 6, 8, 9, C)

APOGONIDAE
Apogon nigripes Plfr (4, C)
A. semiornatus Peters (4, R)
Apogonichthyoides nigripinnis C+V (4, 6, P)
Cheilodipterus artus Smith (4, 5, 6, C)
Ostorhinchus angustatus Smith (4, 5, 6, C)
O. cyanosoma (Blkr) (4, 5, 6, C, often among sea urchin spines)
O. fleurieu Lac (5, P)
O. savayensis (Gnthr.) (2, 5, 6, C)
Paramia quinquelineata (C+V) (4, 6, C, often among sea urchin spines)
Pristiapogon frenatus (C+V) (4, 5, C)
CARANGIDAE
Gnathanodon speciosus (Forsk). lagoon generally, juveniles only, R
MULLIDAE
Pseudupeneus macronema (Lac) (3, 6, C)
PLATACIDAE
Platax pinnatus (Linn) (2, P, juveniles only)
MONODACTYLIDAE
Monodactylus argenteus Linn (5, P)
POMACANTHIDAE
Centropyge multispinis (Plfr) (5, C)
Pomacanthodes chrysurus (C+V) (5, 6, R, juveniles only)
P. imperator (Bloch) (5, 6, R, juveniles only)
P. striatus (Rupp) (2, 5, 6, R, juveniles only)
Pomacanthops semicirculatus (C+V) (5, 6, R, juveniles only)
Pygoplites diacanthus (Boddaert) (5, one record only)
CHAETODONTIDAE
Chaetodon auriga Forsk (3, 4, 5, 6, 7, C)
C. guttatissimus Benn (5, one record only)
C. leucopleura Plfr (7, R)
C. lunula (Lac) (juveniles 2, 5, adults 9, 10, C)
Heniochus acuminatus C+V (5, R)
ACANTHURIDAE
Acanthurus leucosternon (Benn) (9, 10, C)
A. lineatus Linn (10, C)
A. triostegus (Linn) (7, 8, 9, 10, C)
A. xanthopterus C+V (5, 10, P)
Zebrasoma flavescens (Benn) (9, 10, R)
Z. veliferum (Bloch) (5, P)
ZANCLIDAE
Zanclus cornutus (Linn) (5, 9, 10, P)
LEIOGNATHIDAE
Leiognathus equula (Forsk) (lagoonal, seasonal, dense shoals)
KYPHOSIDAE
Kyphosus vaigiensis (Q & G) (5, R)
PEMPHERIDAE
Pempheris oualensis C+V (5, 9, C, in shoals)
LUTIANIDAE
Lutianus fulviflamma (Forsk) (2, 4, 6, 8, C)
L. johni (Bloch) (4, 5, C)
L. kasmira (Forsk) (4, 5, 6, P)
Macolor niger (Forsk) (5, juveniles only, R)
GATERINIDAE
Gaterin flavomaculatus (Ehren) (3, 4, 7, C)
G. orientalis (Bloch) (3, 4, 7, P)
G. playfairi (Pell) (3, 4, 7, R)
POMACENTRIDAE
Abudefduf annulatus (Peters) (6, 8, C)
A. cingulum (Klunz) (6, 8, C)
A. lachrymatus (Q+G) (5, P)
A. saxatilis (Linn) (2, 8, 9, C)
A. septemfasciatus (C+V) (2, 8, 9, C)
A. sexfasciatus (Lac) (2, 8, 9, C)
A. sparoides (C+V) (2, 9, C)
A. xanthozonus (Blkr) (6, 8, C)

Amphiprion ephippium (Bloch) (in sea anemones, C)
Chromis dimidiatus (Klunz) (5, 9, P)
C. nigrurus Smith (5, 9, R)
Dascyllus aruanus (Linn) (5, C)
D. trimaculatus (Rupp) (juveniles in sea anemones, adults 5, C)
Pomacentrus pavo (Bloch) (5, C)
P. pulcherrimus Smith (5, 9, 10, C)
P. taeniurus Blkr (5, R)
P. tripunctatus (C+V) (9, 10, C)

LABRIDAE
Anampses meleagrides C+V (10, P)
Cheilinus trilobatus Lac (juveniles, 4, R)
Cheilio inermis (Forsk) (three colour forms, 4, C)
Coris africana Smith (4, 9, 10, P)
C. angulata Lac (4, 9, 10, P)
C. caudimacula Q+G (4, 9, 10, C)
C. formosa Benn (4, 9, 10, P)
Gomphosus caeruleus Lac (10, R)
G. varius Lac (5, 9, 10, C)
Halichoeres centriquadrus (Lac) (5, 9, C)
H. kawarin Blkr (5, 9, C)
Labroides dimidiatus C+V (5, 8, 9, 10, C)
Novaculichthys taeniourus (Lac) (3, 4, R)
Stethojulis axillaris (Q+G) (5, 9, C)
Thalassoma hebraicum (Lac) (5, 9, C)
T. lunare (Linn) (5, 9, C)

CALLYODONTIDAE
Xanothon margaritus (Cartier) (3, 5, R)

MUGILIDAE
? Valamugil seheli (Forsk) (juveniles only, 2, R)

SPHYRAENIDAE
Sphyraena ?jello C+V (juveniles only, 2, R)

SIGANIDAE
Siganus oramin (Bl-Schn) (10, P)

GOBIIDAE
Acentrogobius reichei (Blkr) (2, C)
Gobiodon rivulatus (Rupp) (in coral only, C)

BLENNIDAE
Meiacanthus mossambicus Smith (5, P)
Omobranchus mekranensis (Rgn) (2, P)
Runula rhinorhyncos (Blkr) (5, 9, C)

SALARIIDAE
Exallias brevis (Kner) (9, R)
Istiblennius andamanensis (Day) (2, C)
I. bellus impudens Smith (2, C)
I. edentulus (BI-Schn) (2, C)

SCORPAENIDAE
Pterois volitans (Linn) (5, 9, C)
Pteropterus antennata (Bloch) (5, 9, C)
P. radiata (C+V) (5, 9, P)
? Scorpaenodes spp. (5, 9, C)

PLATYCEPHALIDAE
Platycephalus ? grandidieri (Sauv) (3, R)

OPHICHTHIDAE
Myrichthys colubrinus (Bodd) (3, 4, 8, C)
M. maculosus (C+V) (3, 4, 8, R)

MURAENIDAE
Echidna nebulosa (Ahl) (5, 6, 8, 10, C)
E. zebra (Shaw) (6, 8, R)
Lycodontis spp. (5, 6, 8, 10, C)
Siderea spp. (5, 6, 8, 10, C)

MONACANTHIDAE
Amanses fronticinctus (Gnthr) (6, 8, R)
Paraluteres prionurus Blkr (6, 8, R)

BALISTIDAE
Rhinecanthus aculeatus (Linn.) (5, 6, 8, C)
R. rectangulus (Schn) (5, 6, 8, R)
OSTRACIIDAE
Lactoria cornuta (Linn) (5, 6, 8, 9, P)
L. fornasini (Bianconi) (5, 6, 8, 9, R)
Ostracion lentiginosum (Bloch) (5, R)
O. tuberculatus (Linn) (5, P)
DIODONTIDAE
Diodon hystrix Linn (4, 6, 9, C)
TETRAODONTIDAE
Arothron sp. (4, one record only)
CANTHIGASTERIDAE
Canthigaster bennetti (Blkr) (5, 6, 8, 9, (C)
C. janthinopterus (Blkr) (5, 6, 8, 9, R)
C. margaritatus (Rupp) (5, 6, 8, 9, P)
C. valentini (Blkr) (5, 6, 8, 9, C)
ANTENNARIIDAE
Antennarius ? chironectes Lac (5, 6, 8, P)
A. ? oligospilos Blkr (5, 6, 8, R)
Histrio histrio (Linn) (5, 6, 8, R)

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OBSERVATIONS ON MACKINDER'S EAGLE OWL

BUBO CAPENSIS MACKINDERI SHARPE

ON A KENYA FARM

By

P.H.B. Sessions

Lengetia Farm, P.O. Mau Narok, Kenya

INTRODUCTION

This paper amplifies the previous notes on this bird (Sessions 1966) and is primarily based on field observations made in the Mau Narok district of Kenya over the last eight years. It also aims to be a corollary to the paper on the distribution and systematics of *Bubo capensis* Smith by Benson & Irwin (1967), providing additional information on habits, and discussion of various points that arise.

There appears to be no published work entirely on the habits of *B. capensis*, let alone on the race *mackinderi*, and details given in all the standard works of reference are scanty. To quote from McLachlan & Liversidge (1970) on the Cape Eagle Owl *B.c. capensis* Smith: "remarkably little has been recorded about its habits. Data are urgently required." These notes are taken from a large number of short observations made on this farm and environs to within a radius of 15 km. A description of the situation and topography of this area was given in Sessions (1966).

DISTRIBUTION

General

Benson & Irwin (1967) show Mackinder's Owl to occur sparsely on high ground over the 3000 km separating *B.c. dillonii* Des Murs & Prevost in the north from the nominate race at the Cape, the heaviest concentration being across the Kenya Highlands from Mt. Kenya to Mt. Elgon. Thirty years ago it was confirmed only on Mt. Kenya itself (Jackson 1938); Priest (1933) made no mention of the owl in his work on the birds of Southern Rhodesia, nor did Belcher (1930) record it from Malawi. Mackinder's Owl has now been collected from both these territories and may eventually be found to be quite common in suitable localities.

It has been suggested by Benson & Irwin (1967), also Moreau (1966) that the populations of this owl are likely to be isolated and static, but this may not be strictly the case. So far the bird has not been found breeding below 2500 m, and although breeding birds tend to be resident throughout the year, there are a number of records from as low as 1800 m, generally in the vicinity of a higher land mass.

One would expect the immatures of such large birds of prey, which have dense local breeding populations, to incur fairly wide distributional movements, and that young birds

would make individual flights from their own area to an adjacent one. Bent (1961) implies that the Great Horned Owl or American Eagle Owl *B. virginianus* (Gmelin), whose habits appear similar to those of *B. capensis*, wanders up to 30 km within a year of being banded as nestlings. Birds could travel in stages between the two most distant breeding areas in Kenya, Mt. Kenya and Mt. Elgon (c. 500 km) without descending below an altitude of 1800 m. This might account for non-breeding records by Brown (pers. comm.) who saw one bird at Nyeri, of another seen at Limuru, and by Forbes-Watson who told me that he picked one up on the main road at the foot of the Kijabe escarpment. All were at altitudes of about 1800 m and within 30 km of known breeding areas. Further south similar climatic conditions occur at lower elevations, and Benson & Irwin (1967) quote records at Dedza (1550 m) and Bambata Hill (1472 m).

Mackinder's Owl may occur in large numbers on the moorlands of Mt. Kenya up to the base of the main peaks at 4270 m and down to 2440 m on the north-eastern slope where there is open land. On the other sides of the mountain the forest extends much lower and the owl does not occur again in numbers until the Aberdare range, where Williams (1966) reports it as common. I have seen it on the eastern slopes above Ngobit at 2440 m. Its range is interrupted again to the west by the Rift Valley, and the owl is then found on the plateau of the Mau. Here it occurs regularly through Mau Narok to Turi 2440 m, Molo 2600 m and Timboroa 2750 m, west to Lumbwa at 2450 m, thence to Mt. Elgon itself to the northwest. It may be expected on the Cherangani range.

It will be seen that in Kenya the owl's distribution covers most of the larger land masses which exceed 2400 m and occurs at lower altitudes only in the vicinity of those masses. Where it does occur, it may be very common for such a large owl.

Mau Narok

The district of Mau Narok comprises an area of forest and mixed farming land of about 12000 ha, and has been described elsewhere (Sessions 1966). Lengetia Farm is situated at the western end, and it is this area which includes four farms totalling 2000 ha that has been most closely observed. Here ten nest sites have been found, and as most of these are used each year, it would seem that there are ten pairs of resident Mackinder's Owls.

Over the remainder of the district, owls have been seen and reported regularly, some of them for many years. Illuminated by car headlights, these birds are seen mainly on telephone poles and occasionally their flight lines to the hunting perches are seen. Assuming the owls breed near water, it is possible to deduce their approximate breeding area, although the nests have not been seen, and there are definitely at least ten pairs of owls here. As most of the observations have been made from the road, it is possible that the total number may be two or three times as many.

Considering the western area again with its ten confirmed nest sites, there is an average territory of 200 ha per breeding pair. The land is cut by streams running from north to south, and these valleys are from 1-2 km apart. The nest sites, which are always besides the water, are separated by distances of 1-2 km. Taking an average territory where the streams are 2 km apart and the nest sites separated by 1 km, the area would be 2 sq. km or 200 ha. There is no reason to suppose that the area which has been more closely studied is different to the remainder, except perhaps that it is rather better watered. One may therefore infer that Mackinder's Owl has a similar population density over the whole district.

Birds from most of these territories have been observed regularly over the last 18 years and it seems that the population has remained remarkably static. A steady increase in the number of resident birds would not be apparent however, without very careful observation of all breeding sites. I had known of one pair breeding regularly on a 11 km section of stream. One year I found two pairs nesting on this section, and the following year there were three pairs, but it will take further study to find out if this increase is temporary or permanent, and if similar increases are occurring on other

sections of streams. The pairs that have been observed in the permanent territories have nested regularly in the same vicinity and continue to use the same hunting area and vantage posts year after year.

To the south-west of Mau Narok lies thick forest and Mackinder's Owl is probably unusual here. To the north and south are open plains with patches of forest and local tribesmen confirm that the owl is common in this area. To the east is the Rift Valley escarpment, covered in forest and scrub; above this line is the lower limit of Mackinder's Owl's range. Below the forest, on the Rift Valley plain, the Spotted Eagle Owl *B. africanus* (Temminck) is a resident species, and there appears to be no overlap.

The distribution and density of Mackinder's Owl in the Mau Narok farming area seems to have remained constant before and after the land was developed. It may be supposed that the population in the undeveloped land to the north and south would be of the same order. Thus on the 80000 ha comprising this part of the Mau plateau as far as Molo and Turi there may be 300 breeding pairs or more. The only other bird of prey which occurs here in numbers of this order is the Augur Buzzard *Buteo rufofuscus* (Forster) and their population would be about the same.

HABITAT

It has been shown that the habitat of the owl comprises a fairly extensive piece of grassland together with a section of valley down which water flows, at least temporarily. Light timber is favoured as well as some rocky places, but either or both may be dispensed with; if the latter case, small bushes or heather are required for nesting sites and roosting.

I have not found the bird in deep forest, about 45 m being their maximum penetration; one pair actually nests in a thick patch of heavy timber on the bank of a stream, but it is a narrow spur, and the owls fly clear of the trees with a few quick wing-beats. The owl will make full use of exotic trees such as pines, cypress, gums and wattles for daytime roosts and hunting perches at night (cf Benson & Irwin (1967), p. 4, re *B. africanus*).

Altitude seems to be a major criterion for the lowest limit of their breeding range, and from personal observation this would seem to be about 2440 m near the equator. Of the two roads that run down to the Rift Valley from Mau Narok, one runs east, the other north; both pass through thick forest on the escarpment. Above this forest I have seen *B. capensis*, and below it, from 2100 m, only *B. africanus*.

Regardless of the terrain which the various local populations of *mackinderi* inhabit, there is one common factor, and that is the presence of water, near which the owl makes the centre of its territory and the base of its breeding site. I have found no exception to this pattern.

OTHER SPECIES OF STRIGIFORMES

An important aspect concerning any owl is its toleration of other species of night predators. These have more specialised requirements than diurnal ones or the number of their species would be greater; hence there must be a lower interspecific tolerance. Brown (1970) says that the Mountain (Mackinder's) Eagle Owl has the field to itself, and this is largely true. Besides some 20 pairs of *mackinderi* on Mau Narok there are only three pairs of Verreaux's Eagle Owls *B. lacteus* (Temminck) a pair of Wood Owls *Ciccaba woodfordii* (Smith) and a single Barn Owl *Tyto alba* (Scopoli). The first two seem rather more restricted to the forest so that *mackinderi* faces competition mainly from itself. The same applies on Mt. Kenya and probably in other montane areas, but one cannot say if this numerical superiority is due to the aggressiveness of *B. capensis* to other owls, such as is shown by the European Eagle Owl *B. bubo* (Linn.) (Bannerman 1955) or to the lack of adaptability in them. *B. africanus* might be expected to occur, but it is more insectivorous, prefers a lower altitude, and would probably be repulsed by *mackinderi*.

However, the three pairs of Verreaux's Owls that inhabit Mau Narok latterly have appeared to nearly overlap the hunting territories of Mackinder's Owls. Both myself and another local farmer, T. Hamilton-Fletcher, have seen them making nightly forays onto the open ploughed land, although no open conflict has been seen to occur. However, the Verreaux's Owl spends the daytime deep in the forest, which is also where it nests, so there is no question of rivalry over breeding sites. Also, Brown (1965) states that this owl has a very catholic diet, which may mean a different hunting routine. For all that, Brown shows that the life habits of this owl are very similar to those of Mackinder's, and as the former appear to be comparative newcomers to this area, there may be an eventual trial of strength when the numbers of both species reach saturation.

DESCRIPTION

Adequate descriptions are found in works of reference to *B. capensis mackinderi*, but it seems reasonable to add some points of field identification, as this bird has been continually mistaken, generally with *B. africanus*, and sometimes with *B. lacteus*. These are essentially greyer birds, with finer barring below.

From above, Mackinder's Owl looks medium to dark brown, with a distinctly tawny band across the neck, and blackish and grey markings on mantle and wings; as it flies away it may show a white patch on wings or tail. Underneath the bird appears paler, with a band of dark blotches on a tawny background across the chest, a conspicuous white throat patch and a pale grey or white belly lightly blotched to the vent with brownish markings. The "socks" are creamy white or grey. The underparts are variable, some very tawny, others much paler. The male is nearly always paler than the female and when together with the female, can be seen to be smaller; it also has the habit of flying off first when disturbed. These details agree with those of Forbes-Watson (Benson & Irwin 1967 p. 10).

Distinguishing features of this owl are its eartufts. They are larger and more conspicuous than in other species, being always visible and are generally held horizontally; vertically only when excited. The eyes are a brilliant fiery orange, distinct from *B. africanus* with its yellowish or brownish eyes, and *B. lacteus* which has black eyes, the lids only being orange. The voice, which most often indicates the presence of an owl, is distinctive, and is described in detail later. Verreaux's Owl has a much deeper note, more of a grunt (Brown 1966), while the Spotted Eagle-Owl has a softer call, though rather similar.

HABITS

Typical of many eagle owls, Mackinder's Owl is not entirely nocturnal and is often seen hunting before sunset and again in the early morning; sometimes one may see it sunning itself by day on an exposed rock or branch.

The usual routine is, at sundown, the owl gives a preparatory hoot from its daytime roost, sometimes giving a few answering calls to its mate. It then flies up the valley in short stages, pausing *en route* on suitable posts, until it finally reaches its hunting ground on the ridge top. Here it will utilise a favourite perch such as a tall tree or telephone pole, or even a chimney top, from which to spot its prey, which may be eaten on the ground or on the perch. After a couple of hours' hunting, the birds return to the roost site in the valley, where they appear to spend a considerable part of the night settled on the ground near the water. The purpose of this habit is not clear, but it may be in order to catch frogs and crabs. Before dawn they are back hunting again on top of the ridge, returning to roost as the sun comes up.

The hunting area of each pair is apparently from the nest/roost base up to the centre of the ridge on either side of the valley, where it meets the owl from the next territory. *B. virginianus* is believed not to battle with its own kind, but forms its boundaries by

vocal display (Ardrey 1960), and it is probable that *B. capensis mackinderi* does the same. Sometimes a prolonged hooting goes on through the night, and this may have a territorial function; normally they only hoot continuously when they have newly fledged young.

The roosting sites of breeding birds are generally within a short distance of the nest area, whether it is in a tree, rock or grassy bank, and the female at least seldom moves far from here. While the pair remain together, they may be found in the same place year after year. Immature and single birds are found elsewhere, on this farm usually in a clump of trees some way from the stream bed. When roosting by day the pair often share the same tree, the larger female sitting upright and close to the trunk, the male perched a little out along the branch. As one approaches the male will slip away first, dropping down to just above the water for a hundred yards, then swooping up to another tree to perch in full view and stare at the intruder. The female sits much closer, and one can sometimes walk right under her before she will fly; their tree perch is about 3 to 5 m above ground and not in dense foliage. Where trees are not available, they will use a small cave or rocky overhang in the same way, and failing even this facility, they will crouch under some low bush or tuft of grass. When disturbed from the nest, the female will fly a few yards to alight on the ground and stare until one departs.

FOOD

One of the requirements of Mackinder's Owl appears to be a superabundance of food, and where this occurs, it usually means that the food is of one kind. For instance on Mau Narok and the rest of the Mau range, it is the mole-rat *Tachyoryctes splendens* (Rüppell) that provides most of its diet, while at the head of the Teleki Valley on Mt. Kenya I found nearly every owl pellet to contain the bones of the rock hyrax *Procavia johnstoni mackinderi* Thomas. At Bale, Brown (pers. comm.) found the Ethiopian race, *B. capensis dillonii*, was feeding mainly on mole-rats, although one nest contained large numbers of skulls of a frugiverous bat.

Again, *B. virginianus* shows a similarity. Errington (1940) in his studies on the prey of this owl reported that remains of Leporidae were represented in 3315 pellets and stomachs, out of 4838 examined. The main member of the family, the cotton-tail rabbit, made up to 80 per cent by volume of the owl's diet. Brodie & Maser (1967) showed that in six collections of owl pellets from one area, *Microtus* formed 77 per cent to 91 per cent of the food items, although in another area the meadow mouse and beetles were taken equally. Errington (1932) summed up: "From the examination of 1900 pellets I feel justified in saying that choice plays a minimal role in the horned owl's hunting routine. The horned owl goes out with the intention of getting something to eat, to take what it encounters first and is able to get."

So although the total species of prey listed indicates that *B. capensis* enjoys a wide range of diet, it is also apparent that each owl tends to adapt itself to preying on one particular animal and then maintaining an almost exclusive diet. At the high altitudes frequented by *dillonii* and *mackinderi* the number of species of small mammals is low, although populations of individual species may be high and also constant. An idea of the mole-rat numbers on this farm may be deduced from the 600 that were trapped from a 12 ha grass ley in one month, and 220 out of the 800 ha on this farm contain this density of mole-rats.

Brown (1970) believed that no class of avian predator would have anything better than a local effect on controlling the numbers of their prey, and this would certainly include Mackinder's Owl. There are 5 or 6 pairs on the farm, and probably an average of 15 individuals throughout the year each requiring about one mole-rat per night. The annual supply of mole-rats needed by these owls is therefore in the region of 5500 to be drawn from a population of many times this figure, and which is constantly reproducing itself. On the other hand although this predation does not have any diminishing

effect, the absence of this owl might allow the mole-rat to reach plague proportions. This rodent is about 20 cm long and an adult might weigh up to 250 g. From the number of skulls I have found in their casts I reckon the owl kills up to three in one night, for they may of course only eat the head.

At the top of the Teleki Valley on Mt Kenya, hyrax are very numerous, the piles of rocky moraine appearing to come alive with these animals at times. Coe (1967) estimated a population of 80 hyrax to 20 ha, but this seems a conservative estimate for the more favourable areas where the runs are worn bare and smooth like a footpath, and the smell of their faeces hangs everywhere. Close to one of the colonies there was a thin forest of tree groundsel *Senecio keniodendron* R. E. Fr. & Th. Fr. Jr., where in June 1969 I found large numbers of Mackinder's Owl roosts. About 25 per cent of the trees had been used at one time or another and under each of these trees were a collection of pellets all containing hyrax bones. Pellet sizes compared with those found on Mau Narok, i.e. up to 100 mm$\times$35 mm. The hyrax weighs up to 3.5 kg and the smaller ones should provide an easy prey. The weaker Augur Buzzard was observed to take them readily (Coe 1967). When eating hyrax the owl leaves the head. Many skulls were found lying bleached beside the pellets. *B. virginianus* was also found to dispense with the skull of a young beaver, presumably an animal of similar size, in the same way. (Brodie & Maser, 1967: p. 12). The *Otomys* rat is similar in size to the mole-rat, and is also abundant in places on the mountain.

Other items of food include the smaller rats and mice as well as larger mammals such as the African Hare, *Lepus capensis* L. On the four occasions that I know of it being taken, three of them at least occurred while the owl was breeding. Once the owl was seen by A. Forbes-Watson (pers. comm.) to make its kill by the headlights of his car; another time the attack was made in mid-morning and a third time the bird killed at dawn, bringing the hare straight to the nest where I found it still warm and limp at 9.00 a.m. The fourth hare I found on a slab of open rock-face near the river and *c.* 100 m from the nest; it looked as if the animal had been killed elsewhere and the bird was too exhausted to carry it further for the hare was broken up piecemeal and carried to the nest over the next four days. The hare is nowhere very common, suffers from many predators, and cannot form a large part of the owls' food supply, but it would appear a useful addition when more food is required quickly to feed growing nestlings.

Birds are also an unusual part of the diet; a Black-winged Plover, *Stephanibyx melanopterus* (Cretzschmar), was seen killed and carried off to some pine trees in the middle of the day and two nests were found containing feathers of the Montane Francolin, *Francolinus psilolaemus* Grey. I have also recorded kills of the Pink-breasted Dove, *Streptopelia lugens* (Rüppell) and Hammerkop, *Scopus umbretta* (Gmelin). L. H. Brown (pers. comm.) found a leg bone of a domestic fowl in the roost of *mackinderi* on the escarpment at Kijabe.

Evidence of insects in the casts are not frequent, although I have found the wing cases of a large beetle. The most frequent remains other than those of small rodents found in pellets on Mau Narok are those of a fresh-water crab, which is common in the mountain streams here. In about a quarter of the pellets examined crab shells have been found. Sometimes a whole carapace of up to 25 mm across, or a claw of up to 30 mm long. Other crab shells are found alone, where the friable parts of the pellets have been washed away by rain. The crabs are also brought to nestlings. On one occasion a pile of shell was found on a "feeding block" about 5 m from the nest; the crabs had not been eaten whole as they would have been by an adult, but the meat had been picked out and the shell discarded. It is worth noting that there are no records in Witherby (1946) or Bannerman (1955) of *Bubo* eating crabs, but *B. virginianus* is known commonly to take crayfish; see Bent (1961 p. 309), Errington *et al* (1940: p. 807), Marti (1969: p. 166), Brodie & Maser (1967: p. 11), but not to any great extent, and according to Marti (*op. cit.*) these are rather small crustaceans, of the genera *Reithrodontomys* and *Perognathus* weighing only between 5 and 12 grams. Curiously, the Great Horned Owl does not assimilate them as easily as Mackinder's Owl does the crab, for often the skeleton of

the crayfish is found separately to the pellet. Only in the case of juvenile owls have I found the crabs to have had the flesh pecked out of the shell.

Otters are common on the streams which the owls haunt and frequently leave crab shell as remains of their meal. However, the remains are easily distinguished from those eaten by the owl, as they occur as neat piles of finely ground shell generally on a rocky track used by the otter. The owl pellets contain whole claws, shells and other parts of the crab, and even when the rain has washed the friable parts of the pellet away, the crab shell still lies in the outline of the original cast.

B. bubo is known to take large numbers of frogs (Bannerman 1955) and it is more than likely that Mackinder's Owl does the same, for frogs and tadpoles are exceedingly common all along the streams where the owls spend long hours, but their remains are not easily visible in a cast (Errington, 1940: p. 764).

Marti (*op. cit.*) has shown that the mean prey weight for the American Horned Owl is 220 grams, and Errington *et al* (*op. cit.*) have shown that the average meal for that bird is six large mice or half a large rat, but what is not shown by any researcher is the number of meals taken in 24 hours by a bird, or the number of pellets brought up. Examples from captive birds do not necessarily prove what happens in the wild.

It was stated earlier that the owl eats from one to three mole-rats per night, judging from teeth and skulls found in the pellet, but it has been shown that eagle-owls eat the head of rodents first, and it may be that not all the prey were consumed entirely. Conversely, if the owl has ejected more than one pellet, it may have eaten more than three moles. It appears that the owl does a twice-nightly hunt for rodent prey, at dusk and dawn presumably successfully, and also spends some of the intervening hours looking for frogs and crabs by the river bank. This is rather in contradiction to that of Errington *et al* (*op. cit.*: p. 810) who consider that *B. virginianus* takes the first convenient prey that comes its way. I consider that *B. capensis* is more methodical, and although an opportunist on occasions, would hunt a particular area for a specific prey.

VOICE

Two common sounds made by the adult owl are a resonant hoot and a short bark; both sexes make either sound, although the female has a deeper hoot. Before the evening hunt commences, the bird makes a single long "hoooooo", (cf. Meinertzhagen (1954) on the call of the Egyptian Owl *B. ascaphalus* Savigny.) While hunting it makes a double note, either short-long or long-short, ie.. "hu-hoooooo" or "hoooooo-hu", or less often a triple note, "hu-hoooooo-hu". If the bird has a "song" (q.v. Whitherby (1938) for *B. bubo*) it is a quick, high-pitched triple hoot, rapidly repeated; I heard this once from a displaying bird (see Display).

The alarm call is a sharp "wak wak" like the bark of a jackal comparable to the "kvek kvek" call for *B. bubo* (Whitherby 1938), and the "whok whok" of Verreaux's Owl (Brown 1965). When danger diminishes the adult may call a softer "werp werp" to reassure mate or young, and this too is the call heard at night when the young are being trained to hunt. Hoots and barks are often mixed at random, especially when the birds are startled or upset. Sometimes one of the pair will hoot, while the other barks, or again an individual may make both sounds. Other occasional sounds are a mewing noise by the female under extreme excitement, and a soft croak by the male, which is probably a warning note. The nestlings' hunger call is a whining "kleeeee kleeeee" and when alarmed they hiss. By the time the young is nearly fledged it develops a churring noise which finally becomes a loud snarl, "scrrrreeeeerk", often uttered in daytime, and usefully indicating where the young birds are hiding after leaving their nest. In common with other eagle owls, both young and adults click and snap their bills when under provocation.

DISPLAY

None of the daylight aerial displays described for *B. bubo* (Bannerman 1955. p. 173) have been observed, and indeed one would not expect them from a pair of birds which are resident, share the same hunting territory, roosts throughout the year and where climate and food supply scarcely vary. It is probable that some arboreal form of pre-nuptial display takes place at dusk or by night. I have seen it occur once by day, apparently triggered off by fright. The pair had been roosting in a low cedar tree and when disturbed flew off to settle close together on a branch of another nearby cedar. Both birds then made a series of rapid triple hoots "cu-coooo-cuk", the female sitting bolt upright, the male bowing with each hoot and facing the female. A few days later I found this female sitting on eggs. This display is similar to that of *B. bubo* described by Witherby (1938). The only record I have of coition is that observed by Mr. and Mrs. Philip of Mau Narok, who saw a pair mating on the road near their house in July 1971; the time was shortly after dark and the birds were quite unperturbed by the car headlights.

The Mackinder's Owl is generally by no means as fierce as it looks; normally I can approach and examine a nest containing egg or young while the parent birds quietly watch me from a tree or rock close by. In fact they are easily the tamest and most confiding of the large birds I know. One pair varied slightly by flying from tree to tree around the nest, peering and craning their necks whilst they hooted and barked; doubtless a sort of distraction display. The only exception occurred when I was looking for a nest on another farm, whose location I could only roughly guess. A person had reported a variety of frightening noises from an unseen bird and had been unwilling to investigate: I suspected a pair of breeding Mackinder's Owls. On approaching the site, I disturbed an owl in a tree which flew off a short distance. As I searched for the nest it returned to the first tree and, drooping its wings, barked at me. As I got nearer to the young (without knowing) the bird got more and more frantic, flying from tree to ground to post, all the time trailing its wings, apreading its tail and dilating its startling orange eyes. Judging from its size and colouring, the bird was a female. She kept up a continual clacking of her bill, hissing, barking and growling, occasionally making deep throaty hoots, puffing out her white throat feathers as she did so. In between these sounds she made thin mewing noises. Eventually I crossed the stream to look back, and saw her two owlets safe on a rocky ledge over the stream, protected by an overhang of the bank on which I had been standing. The bird then became even more furious, and, alighting in the thick tussock grass, she advanced on me, trailing her extended wings, bill and eyes open wide. It was quite the most remarkable display I have seen by any bird, and I would class it as one of intimidation rather than distraction; one can imagine why the young are comparatively safe from small predators even if their ground nests are so exposed.

Errington (1932) found "in general the parents displayed the most toward their young about the time the latter were ready to leave their nest . . . . . The old birds would fly off and leave downy owlets. . . . . without apparent reluctance." This observation on *B. virginianus* coincides with those I have made on *B. capensis*. Tyler & Saetveit (1969) made the same conclusions.

The male bird seems the more retiring of the pair, slipping away quickly at the approach of danger, and generally maintaining a greater distance than his mate. His prime role seems that of watchdog, signalling the alarm to his mate sitting on the nest.

BREEDING

(a) **Dates.** Mackinder's Owl breeds on Mau Narok from July to March, the peak laying dates being from September to December. Working back from known incubation and fledging periods, the laying dates for 26 nests in this district are as follows:

July	August	September	October	November	December	January	February	March
1	2	4	4	6	5	1	2	1

There are no indications that the local owls breed outside these months, although the later dates tend to be for pairs inhabiting the more open land in the centre of the plateau. A number of pairs have shown a tendency to breed at 10 to 11 months' interval, which may mean eventually that there will be breeding records for all the months of the year. The only breeding date given in Praed & Grant (1952) was for January on Mt. Kenya.

(b) **Nesting.** Nuptial display has already been described, but normally the first indication that breeding is about to commence is that the pair roost closer together during the day, often side by side, usually in a tree or on the ground very close to the prospective nest site. This behaviour compares with that of *B. virginianus*, (Errington *et al op. cit.*: p. 765). Finally the female flies down to lay and brood. No actual nest is made, but care is taken that the site is suitable and has remained undisturbed over a long period. If the owls notice that their chosen spot is too frequented they will mark down another place. 24 of the 26 nests so far found have been at ground-level although there are adequate sites in trees all over the farm, including trees with old bird of prey nests said to be favoured by the other races e.g. Priest (1948): "in disused nest of Buzzard or Eagle", Praed & Grant (1952): "in the disused nests of Crows and other large birds". The nests are merely a shallow scrape or hollow formed by the brooding bird's body, and contain no down or grass lining. The siting of the nest seems almost haphazard at times, but there is usually some protection at the back of the sitting bird, even if it is only a small bush. Often it is at the base of a large cedar tree *Juniperus procera* or slab of rock, but, wherever it is, there are two common factors; the nest is nearly always at ground level and it is always within a stone's throw of water. The latter point seems inexplicable; however it is a great help when trying to locate a nest. Two nests were actually found over the water on the top of leaning tree stumps, others right on the grassy bank of the stream, quite exposed. The following table describes the situation of 25 nests found within 8 km of the farm:

1 In fork of tree, 15 m above ground.
6 On or against a bare rock face.
6 At the base of a large cedar tree.
6 In grass, with or without light bush protection.
2 On top of large tree stumps, placed on a bank and level with ground.
4 Under logs.

These nests belonged to eight different pairs, and only two nests were used consecutively, in one case twice, the other for three years. Otherwise the nests would be within 10-50 m of the previous year's, generally the lesser distance.

The one occasion when I found the owl nesting in a tree was of particular interest, since it was the exception to prove the rule. The pair involved had nested regularly at the base of a large cedar for at least three years, and as I had known them to frequent that tree for at least fifteen years they may have used the nest site for much longer. In order to obtain confirmation of incubation, brooding by sexes, egg size etc., I made fortnightly inspections of the nest site from about one month prior to the expected laying date, which was usually at 11 month intervals. It was with some surprise that I found the nest in a deep fork of the same tree, some 15m above the ground, with two white-downed nestlings in it. I have no doubt that the owls had been worried by my visits, but had no intention of forsaking their well-loved tree, and compromised by nesting above my head. A week later the two young owlets were somehow transferred into the old nest at the base of the tree. This action convinced me that Mackinder's Owl is basically a groundnester by preference. It was notable also, that the bird did not choose one of many available old buzzard or eagle nests or a hole in a tree, but used a crotch formed by a large branch which was similar to a ground nest; no material was used to embellish the nest.

For comparative behaviour in the Great Horned Owl, Errington (1932) has shown that very small owlets can safely reach the ground from great heights long before they can fly; in America this would occur when the actual stick nest collapses and the chick has no option. He goes on to say that the grounded chick makes its way to the base of the nearest tree where it continues to be cared for by the adults: "it may make scant difference in the end whether the young spend their full time in the nest or not." However in the case quoted above, one of the owlets disappeared soon after it reached ground, whereas it might have survived in its original nest. Errington also pointed out that the Great Horned Owl is a very poor nest builder, seldom even refurbishing old hawk nests it takes over, so that collapse of the nest is not infrequent. With the knowledge we have of *B. capensis mackinderi*, it might be that all *Bubo* were originally ground nesters and only some species and races have recently taken to nesting in trees, *B. virginianus* and *B. bubo* still retaining both habits.

Referring again to transfer of nest-site, this occurred again about the same time with another pair which had nested regularly in a stream bank within about a 20 m radius over 10 years. Again I made regular checks for about two months in this area, only to find it sitting on eggs on a ledge in a vertical cliff-face over a large pool, 100 m away. The two young were transferred in stages, possibly even carried, back to their old nesting area, whilst still in their downy plumage.

In spite of the exposed nature of the nest sites, the sitting bird seems remarkably secure and only two instances of desertion have been noticed, when I found the broken shells of two eggs, probably trampled on by a flock of sheep which were grazing by the river bank. The parent birds in one case, the male being recognised by a white tail feather, continued to occupy the nest tree for two months afterwards, then finally bred some distance away ten months later. Repeat laying seems unlikely and the birds keep to a laying interval of ten to twelve months.

The brooding bird relies on its camouflage for protection whilst the mate keeps guard from a nearby tree or promontory to give warning of approaching danger. When the bird on the nest hears the single warning hoot it freezes and closes the lids over its brilliant orange eyes and only when one is a few feet away will it fly off to a nearby branch or rock. The camouflage is very effective. Numerous people have failed to discern a sitting bird at close quarters and in full view until it is pointed out. As the young grow, so the nest enlarges into a muddy cake of excrement and pellets of bone and fur, trampled around for several square feet. The nest becomes more conspicuous and danger then increases from predators until the young can fly.

(c) **Eggs.** Of five nests examined with eggs, three had clutches of three eggs, and the others of two. All the nests found with young had two or three chicks, except those with large young, where sometimes there was only one survivor out of what was probably a larger brood. It would seem that 2-3 would be the rule, the larger figures being more common. Of 10 eggs measured, the largest was 59 mm × 46 mm and the smallest 46 mm × 45 mm; giving an average of 57.5 mm × 45.4 mm. The South African race *B.c. capensis*, the only one for which egg measurements are available, has an average of 51.5 mm × 43 mm according to Priest (1948), and rather smaller according to Roberts (1940). The average for *B. b. bubo* is 59.8 mm × 49.7 mm.

The eggs appear to be laid on successive days, brooding commencing with the laying of the first egg; incubation takes about 36 days. One pair under observation before nesting roosted together for some weeks in the nest tree. On 26th October, only one bird was in the tree and the mate was found sittting on the nest, which was empty. Two days later there were two eggs. When the nest was visited on 1st December there were two chicks, lax and immobile, with naked patches on the back. Neither could have been more than one to two days old. At another nest, two newly hatched young and one egg were found. When the nest was visited the next day the third egg had hatched. Incidentally, the third egg was much smaller than average. The chick was weakly and died after a fortnight.

The male and female may be recognised as such when together. But it is not always possible to get a sufficiently good view of the sitting bird to identify its sex with certainty.

However, on all occasions when good views were obtained, the female was invariably the brooder of the eggs. Conclusions are limited by the fact that the sitting bird cannot be identified by night, but I am sure the male relieves her to hunt during this time, as Masai shepherds tell me that they see her leave the nest about an hour before dawn. Once I have put the male off the nest in the early morning when the chicks were very small. At the actual time of hatching, when one would not expect the female to leave, I found on two occasions a pile of freshly killed mole rats lying right besides her, no doubt brought by an assiduous mate.

(d) **Chicks.** For the first three or four weeks the chicks are brooded continuously. Thereafter the female broods less and less but sits in a tree or bush only a few yards away, alert for danger. The male stations himself in another tree to watch in the opposite direction. Only once have I found an owl asleep by day and that was a non-breeding bird. When worried they utter a warning hoot or bark, and the young crouch and freeze at the back of the nest, huddling up together. If the young are molested, they puff up their downy feathers until they look twice their natural size and quite formidable. As a last resort they lie on their backs and strike out with the bill and claw, hissing hard. At six to seven weeks from hatching the young move around the nest site, exploring and perhaps avoiding the hot sun or the muddy nest if it has been raining much.

At two months the owlets may take up a position on a low branch or rock which might be a feeding block as well. Here they spend much of the day preparatory to their first flight. This may depend on how secure and undisturbed they are: some have not flown during ten weeks. Other nests I have found deserted at seven weeks. Twice I have probably instigated their first flight by alarming them suddenly when the juveniles fluttered off, only to flop into the long grass after a dozen wing beats. At this stage they must be very vulnerable. These intervals compare with Tyler & Saetveit (1969) on the Great Horned Owl, viz. 6-7 weeks to leave the nest and flying short distances in 9-10 weeks.

The chicks are hatched almost naked with a little white down which soon covers them all over. After a week the down turns to a dirty grey colour, which gets darker and browner until their first feathers appear. At six weeks they are a grey—brown colour with dark brown barring on the upper parts, and a week later they show developed feathers on wings and tail, with tufts of down scattered all over; the young would be about half the size of an adult at this stage. The eye of the nestling is a bright chrome yellow with a large vivid blue pupil, altogether as striking a feature as that of the adult's eye. The bill and claws are dark horn; the ear tufts are always apparent, even in the downy stage.

(e) **Fledging** Generally by the time the young leave the nest there are only one or two survivors. Only once did I see three fly. Assuming the average clutch size is 2.5, and an average of 1.5. leave the nest, the survival of fledlings is 60 per cent of eggs laid. Of those that die during this period, there is little to indicate what causes the casualties, which occur evenly throughout. Possibly the very young ones are devoured by their parents or nest mates if they die or become weakly. The larger ones are probably taken by ground predators which are very numerous. But the biggest factor noticed so far has been the human one. I have known of five large nestlings being killed by superstitious Africans and three taken captive by farmers as pets.

As soon as the young leave the nest the adults take them into light bush or small trees for cover and for a week or two there is not much sign of their presence. However as soon as the juveniles are flying strongly they are taken further afield at night and given their first hunting lessons. It is at this time that they are most noisy and no-one can then fail to be aware of their presence in the neighbourhood. As soon as it is dark the whole family flies up from the valley to their hunting ground, specially favouring the rows of pine trees characteristic of this farming land. Here they are probably taught to catch the smaller prey such as rats and mice which occur here, rather than the mole-rats and larger mammals which they will later hunt on the open land. Their arrival is announced by much hooting and barking from all directions, and this goes on for two or three hours until all are replete.

As the young become less dependent on their parents, they take less care over concealment and two months after leaving the nest they may be found basking in the midday sun on an exposed branch of a bare tree. There is no indication as to where they disperse but single owls are found roosting in trees away from the valleys at all seasons, which I suspect are the immature birds of the year. Some of those found way out of their normal habitat may be immatures. Probably there is a high mortality among fledged birds, as with all birds of prey and the majority of this normally sedentary species may not travel far, but act as local replacements. The parent birds themselves are less in evidence for a couple of months before they finally recommence their breeding cycle.

At four months the immature owl looks similar to the adult except the ear tufts are smaller. The crown is grey and fluffy with dark stripes and there are long lax feathers over the head. The underparts are rather more barred, and the chest is dark brown rather than tawny. L.H. Brown, (pers. comm.) suggests that eagle owls probably mature very quickly compared to diurnal birds of prey of similar size.

A nestling was found on 2.1.72 which had fallen from the tree nest and it was decided to rear it by hand.

Habits. During the $5\frac{1}{2}$ months it spent around the house the owlet was always left at liberty. Until it could fly to the roof it spent the hours of darkness in the house, to protect it from night predators, otherwise there were no restrictions on its movements.

Errington (1932), referring to the Great Horned Owl, said that only recently-hatched owlets came to recognise their human attendants as they would their parents, and Bent (1961) inferred that these owls were only tame if allowed full liberty for those kept in cages grew sullen and ugly tempered. Both these statements on handreared eagle owls were borne out by our experience. The owlet made a responsive and intelligent pet that always took a keen interest in all around it. Although quite content to perch on one's arm or shoulder it never liked being handled. It was quite unafraid of the house-dogs which were rough with it, never minding being knocked over or pushed about, but a strange dog would immediately produce a fierce reaction. I only saw it run or fly from danger once and that was from an attack by an Augur Buzzard before it could fly, when it ran across the lawn to shelter actually tripping over as it tried to keep an eye on the hawk. Much later it was attacked repeatedly by a large female Peregrine (probably *F.p.peregrinus* Tunstall) as it perched on a high roof, but it responded by spreading its wings in a great bow in front of its body and fluffing up its feathers, and the falcon eventually sheared off. From a month old it kept an eye on all birds of prey including Marabou Storks *Leptoptilos crumeniferus* (Lesson) that flew overhead and was very quick to spot them even when they were nearly out of human vision. But it was only perturbed by the Augur Buzzard which attacked it several times and would probably have killed it but for our intervention.

Bright sunlight was tolerated comfortably and it had no hesitation in looking directly into the sun to watch a hawk, the pupil of its eye contracting to a pinhead in an instant. Heat had a greater effect, and it quickly moved into the shade when it became hot, especially when it was very young. If it found the heat uncomfortable at nearly 3000 metres, one could see why the species is unlikely to be found breeding near the Equator at a much lower altitude. Cold and wet did not worry it, except when it was caught in its first heavy storm, and came to be let in to dry in front of the fire. Otherwise it enjoyed showers and would run on to the middle of the lawn with its wings inverted to wet itself thoroughly. It never drank, although once it jumped on to the bird bath and experimentally paddled and dipped its bill into the water.

A point of interest was the lack of routine in the owlet's life which may have some survival value in the wild. Both before and after it could fly the bird explored a little further and in a different direction each day and would carefully select new day and night perches. By the time it was nearly full grown and had covered its environs its habits became more predictable.

Although the owlet was never able to deal with the live mice or mole-rats that were offered to it, it regularly practised making attacking jumps. Before it was a month old,

the bird would make a series of swift runs across the carpet finishing with a two-footed jump and clenching its claws, sometimes on nothing, at other times on a moth or a bit of paper. As it grew it would do the same action in the garden, running half a dozen steps, then leaping; this appeared to be the way it would eventually catch mole-rats, its staple diet. The owlet was very excited by my wife, as substitute parent, gardening on her knees and turning earth over; the owlet would go at her with a lot of noise just as it would when hungry and about to be fed. It appeared that there was an instinct for catching mole-rats and for begging from its parent when hunting these rodents, although in other parts of its range the mole-rat might not be included in the diet of Mackinders' Owl at all.

The chick was very weak when found, but after three days was able to stand up and take a few steps; after seven days it explored the room, began to preen itself and would voluntarily open its bill for food, instead of being force-fed. After 2 weeks it could clamber up steps, using its wings to help, and by a month it could flutter enough with its little wings to get onto the sofa. It indulged in a lot of wing-flapping exercises each morning, holding tight onto its sheepskin rug as it got stronger, but it was not until 2 months after arrival, i.e. at about 10 weeks old, that it could fly on to the house roof for the first time, and after that its powers of flight developed rapidly.

As the owlet grew to full size, the garden was visited nightly by a number of Mackinder's Owls from various directions. It did not appear as if the owlet took much notice, although at 5 months it may have been following them on their hunts. Almost certainly some of these owls were the tree-nesting family from whence it came, and at just six months old the owlet flew off with them one night, not to return again. Two days later it was seen not far from its original nest, perched conspicuously in a cedar tree and calling continuously.

Food. The chick was fed almost entirely on mole-rats from the beginning and after the first week its appetite slowly increased from one to two a day. Without viscera, head and feet this meant about 100 g to 180 g of meat, but even this had to be cut up into small pieces, as it never learnt to tear up its food. As the owlet grew it was offered live prey, but did not seem to associate it with food, and made no attempt to attack. Errington (1932) said that even at 7 months a hand-reared owl was incapable of catching its own food.

For the first few days the chick was fed at 2 to 3 hour intervals, or even less, then on 4 or 5 feeds until it could fly, when it was only fed as and when it came to the feeding block. By the time it was 3 months it fed mainly in the morning and evening. It quickly reached satiety, and would not eat more than 100 g even when full grown. Warm, fresh meat was preferred to stale, and anything "high" was refused, although it was never hungry enough to try.

When found, the chick weighed 500 g and then increased its weight by an average of 30 g per day, so it was presumed that it was 10 to 14 days old then. Three weeks after arrival it weighed 1120 g and when 3 months it was 1400 g, but by then appeared almost full grown and flying well. At this stage it was difficult to weigh accurately, and recordings discontinued.

Pellets were cast up from the third day onwards, usually in the morning. The first weighed 23 g, and a few days later another measured 70 mm × 32 mm, but they were generally smaller than this. They might be brought up anywhere, for one day the owlet flew to my arm, and after two or three wide gapes it put its claw to its bill as if to pull something away and then produced a pellet (52 mm × 32 mm) which it held at the tip of its bill a moment and then let drop.

Plumage. The down of the baby chick was a finely barred light grey, and the back, thighs and under-wing were still bare at two weeks old. The irides were chrome yellow and the pupils blue, becoming quite dark at two months. The significant changes are given here, dated from the hatching date, assuming it was two weeks when found.

3 weeks: wings acquire more clearly defined bars and flight feathers start to shoot.

4 weeks: white area around gape very apparent and operculum now visible.

5 weeks: first four tail feathers break sheaths and first signs of downy "ear-tufts" seen.

6 weeks: has 20 fine grey bars on underparts and the well-grown flight feathers are brown with pale tawny spots.

8 weeks: losing down fast, tail and wings growing rapidly.

11 weeks: most of down moulted except on thighs and "ear-tufts", and dark brown feathers appearing on chest.

14 weeks: downy "ear-tufts" now moulted, but the feathered ones did not appear until a month later, and still growing at six months.

At six months old it was difficult to distinguish the bird from an adult and it was disappointing that the bird unexpectedly flew off before final measurements were taken to discover if it was male or female; at that time the measurements were in the overlap between a large male and a small female. At three months the wing was 375 mm and the tail 240 mm; three weeks later the wing was 400 mm and it weighed 1400 g, and it may well have gone on growing. Benson & Irwin (1967) show a maximum of 402 mm for male wings and a minimum of 406 mm for females, and the weight of a male as 3lb 1 oz (1387 g). The tail length is significant as Benson & Irwin (op. cit.) showed four males to have an average tail length of 209 mm. Two factors may be relevant: the bird was probably a female with a longer tail anyway, and posssibly juvenile birds have much longer tails than adults as in many birds of prey such as the Augur Buzzard. Hence the tail length would be a convenient method of determining if a specimen was immature as there is very little otherwise in which it differs from an adult.

During the time that the owlet was reared, a watch was kept on the nestling left in the tree nest, and it was noted that all plumage changes and growth rate occurred in the two young birds at the same times. They even learnt to fly simultaneously.

Voice. At two weeks old the chick only made soft cheeping noises, especially when hungry or being covered. A week later it gave its first squawk, and this was its main cry until it left. This call is difficult to describe but might be written as "shreer", and was generally rather short and sharp. The call was used to indicate everything from hunger to annoyance and excitement, or even nothing at all, being purely reflex. Sometimes it called all day long, even when asleep or preening.

When five weeks old it gave its first triple hoot, but this was seldom heard until it was nearly six months old, when it began to answer the many owls calling round the house. It was also able to give the alarm bark, "wak wak", at an early age when upset by the appearance of a strange dog, but again this was seldom used. Bill snapping was a regular sign of annoyance, although sometimes it would clack softly just to call attention to itself as it glided round the garden at dusk just above one's head.

DISCUSSION

From the foregoing notes, taken with those of Benson & Irwin (1967), a significant number of questions for discussion would appear to arise.

(a) There have been *lacunae* in the observations of a number of large birds of prey in Kenya, but none so obvious or inexplicable as for Mackinder's Owl. During the last ten years, the author has recorded the presence of some 300 species of birds on this 800 ha farm and nearby surroundings. All of these birds except the very rare stragglers have been listed correctly for locality either by Jackson (1938) and/or Praed & Grant (1952) with the sole exception of Mackinder's Owl; yet it has been shown that there are probably several hundred in the locality. Prior to Benson & Irwin's summary (1967), the only genuine locality given by both Praed & Grant, and Jackson was Mt. Kenya. More recently Williams (1967) adds Mt. Elgon and the Aberdare range. The most recent survey by Benson & Irwin (1967) adds Timboroa, Lumbwa and Turi, all lying to the north of the

Mau plateau. Betts (1966) in a survey of the breeding birds of S.W. Kenya, which included the actual Mau Narok area itself, omitted Mackinder's Owl.

The omission does not apply to Kenya only. Roberts (1940), did not mention even the existence of another race of *B. capensis* although his work described the distribution of races of all other birds. Belcher (1930) did not include it in his *Birds of Nyasaland*, although it is now known probably to occur regularly throughout the highlands of that country (Benson 1953: 42). Priest (1933) in his *Birds of Southern Rhodesia* did not include it either, yet here again it has been accepted as having a fairly widespread distribution (Benson & Irwin 1967). It is worth considering whether the reasons for its oversight in the past were due to (i) a more restricted range, or (ii) confusion with the smaller African Eagle Owl *B. africanus* whose range is contiguous, even if it does not overlap, or (iii) merely having evaded observation. The latter seems unlikely, as the bird is well known to farmers and the surrounding African population. From the description of its habits and voice it will have been seen that the bird almost forces its presence on one's attention. It is also doubtful if the owl has radically extended its range, especially in view of the experience in this area, where the land has been converted from its primaeval state into a fully developed farm in the last eighteen years and the population and territories of Mackinder's Owl appear virtually to have remained unchanged.

Concerning the confusion with *B. africanus*, there can be no doubt that this has occurred for it has actually happened with museum specimens *vide* Benson & Irwin (1967) for four mis-identifications. It was even thought that the type specimen of *B.c. dillonii* had been mistaken for the Spotted Eagle Owl, but Benson & Irwin (1969) confirmed that it was indeed *B. capensis*. If there can be confusion over skin specimens, there can be little doubt that all the more mistakes must have occurred in the field.

The conclusion may be reached that a combination of all these circumstances have invalidated a true assessment of the distribution and status of Mackinder's Owl. Even so, there lingers an element of mystery as to how the bird should have been first found and described so thoroughly some seventy years ago from one of the least visited and frequented areas of the country, the alpine zone of Mt. Kenya, and yet remained overlooked in the populated regions of the East and Central African farming lands.

(b) Why is there so little information on the habits, breeding, etc., of such a large and numerous bird?

Praed & Grant (1952) give no description of the eggs of either *dillonii* or *mackinderi*, and the only nest described was that found in a cave on Mt. Kenya by the late Myles North. They quote that *dillonii* is reported to use old tree nests, but this seems unlikely and probably it was *B. lacteus* that was referred to. Nevertheless, the nests are not difficult to find, especially when there are young in them and it is odd that they have not been found more often in the past. It may have been that some of the early information of the habits of birds in this country was obtained with the assistance of African collectors and hunters (see Jackson, Archer etc.) whose superstitions concerning owls may have made them rather more reticent about this bird.

(c) Why has this owl such an affinity for water?

Of the nineteen nests inspected around this farm, all were found to be situated within a short distance of water, the maximum distance being 50 m away but the majority much closer. Of a similar number of pairs breeding locally whose nests have not been found, observations of their lines of flight to hunting posts show them to be probably nesting very close to water in each case. It is difficult to tell if this is just a regional habit as there is little information from other areas and about other races of *B. capensis*, but one *dillonii* "was shot on a rocky ledge overhanging a stream" (Benson & Irwin). From notes on breeding given above, it could be assumed that this bird might have had its nesting site somewhere in the vicinity of this water. To speculate on the answer to this feature of breeding involves some conjecture. It is fair to assume that an owl which has a definite preference for living in a cooler climate would choose to rear its young in a place which has the least hours of direct sunlight and the coolest night temperatures and it is in the valleys that these conditions will be found. As nearly every valley in the montane regions

in which *mackinderi* occurs has running water for at least part of the year, it may be coincidental that the owl nests near water. But generally there is more support for the theory that this bird must have water for breeding, although the reasons for this will only be found by further study in the field.

(d) Is it significant that the owl has a partiality for crabs?

Fresh water crabs occur commonly all down the highland streams where there is a rocky bed. Where a pair of owls have a territory on this section, one might find 20 per cent of their pellets to contain crab shells. It might be thought that these represent otter faeces; these also occur commonly and eat many crabs, but these are crushed into small fragments, unlike the owl pellets where the carapace and claws are often intact. On one particular occasion I saw an owl about 1 km from the river at 2.00 a.m.,—a few hours later there were pellets containing crab remains below the post on which it had been sitting. The noteworthy point in this connection is that there is no other record of a large owl including crabs in its diet, but whether this is an essential part of its diet remains to be seen. If it is, then it would have a direct bearing on the owl's distribution and choice of breeding ground. Frogs and toads are extremely numerous in these streams and further observation may show that they too form a part of the bird's food. Along the rocky banks may be found many large white faecal splashes made by the owls showing where they must spend many hours during the night when not hunting. It may be, although unlikely, that they just prefer to sit here to devour and digest their prey and rest; or perhaps it is in order to listen for, and catch the crabs (and possibly frogs) which they relish.

(e) What are the ecological requirements posed by Benson & Irwin?

These authors infer that there is a lack of a clear understanding of the precise ecological requirements of *B. capensis*. Some deductions may be drawn from this paper, at least as far as the Mau plateau and *mackinderi* are concerned. Some wider conclusions may be considered as well.

First there is a misconception, stated mainly in works of reference on European birds, that altitude *per se* is a significant factor in bird life. The two direct effects of higher altitude are less oxygen and lowering of temperatures. Unlike mammals, birds do not appear to be affected by shortage of oxygen, for it is commonly known that they fly and live at altitudes which would leave most mammals prostrate. In equatorial altitudes, temperatures remain temperate up to 3000 m or more, and are unlikely to have a direct effect on most birds. The main effect is the indirect one of the change in the plant and insect life which changes their food and environment. Those birds that are not dependent on plants or insects for food, such as the larger birds of prey, are found in Kenya from sea level to 3000 m or more. Some owls, notably Woodford's Owl, *Ciccaba woodfordii*, occur over the same range, and some species of *Bubo* also have a wide altitudinal range, but in tropical regions this does not include *B. capensis*, which has not yet been found to breed below 2400 m. However, the further from the equator that *B. capensis* occurs, the lower the altitudes at which it is found, until at more than 30°S at the Cape it is found at sea level. If the mean day and night temperatures for *B. capensis* are studied, they might be found to be isothermal to a narrow limit. The possible reason for this will be discussed under (f).

In the section on Food it was noted that the tastes of Mackinder's Owl are not catholic, nor indeed has it always a wide variety of food available: but its food requirements are high. To rear three chicks from an exposed ground nest in the shortest possible time and in the presence of a large number of predators, suitable food must be permanently available in large and accessible quantities. (Predators on this farm include leopard, hyena, serval and genet cats, civet, jackal, most of the larger birds of prey, as well as superstitious, malicious and inquisitive humans.)

Moreau (1966) regarded *B. capensis* as a component of the Afroalpine moorland community in E. Africa and Ethiopia, but this does not appear to be totally valid, as the bird has not been found in many of the alpine zones, and yet is common in other areas which are not alpine. Clearly, altitude is not the only factor involved.

Broadly then, the requirements for Mackinder's Owl are as follows:

(i) A super-abundance of suitable prey in a restricted area.
(ii) The presence of water.
(iii) A relatively cool climate.
(iv) Generally the presence of trees, rocks or large boulders, which may provide roosting and nesting sites, as well as look-out perches for hunting: i.e. any broken country that is not a bare steppe or thick forest.

These inferences concerning the ecological requirements are based primarily on the Mau Narok observations, but in June 1969 I visited the Teleki Valley of Mt. Kenya with my son, Lt. M.P.N. Sessions R.N. taking particular note of the haunts of Mackinder's Owls we found there. The following week my son went up the north side of Mt. Kilimanjaro through the forest, past the moorland and scree to the peak, with the special intention of finding signs of Mackinder's Owl, and to take note of suitable localities. Although he is well acquainted with the call note of the owl, he heard no sound of it on the mountain, nor any traces of its casts. The food supply appeared small with none of the teeming colonies of hyrax or the innumerable rodent runs that are found on Mt. Kenya. Furthermore, above the forest line water was scarce and tree and rock cover limited. Thus few of the requisite conditions were met with, and this might apply to other montane areas of East Africa where the owl is inexplicably missing.

A further ecological factor may be taken in conjuction with that of the Augur Buzzard *B. rufofuscus*. This factor has been studied by Bent (*op. cit.* p. 296) and Tyler & Saetveit (*op. cit.* p. 78) in regard to the Great Horned Owl and the Red-tailed Hawk, *B. jamaicensis*, the North American counterparts. Tyler & Saetveit showed that the two species co-existed in the area, described as "river bottom, forest and hilly fields", i.e., typical Mackinder's Owl country, with roughly the same size of territories; owls nested $1\frac{1}{2}$ km apart, buzzards 2 km apart, although owl and buzzard would nest as close as 300 m from each other. On Lengetia Farm one may find owl and buzzard nests within a few hundred metres, but seldom find two owls' or buzzards' nests within 1000 m. The interspecific relevance seems fairly remarkable considering they are using an almost identical food supply. Often I have seen an Augur Buzzard leave a particular telephone pole which it has been using as a hunting perch right until dusk, to be replaced on the very same pole within a few minutes by a Mackinder's Owl.

(f) What have been the effects of agricultural and human population changes on the status of this owl?

When the writer first arrived on this farm, it was in a complete virgin state, the land being covered in rough grass, heather and light bush and occupied by herds of zebra and eland where now there are cattle, sheep and crops. Although detailed notes have been made only over the last ten years, the localities of several pairs of owls can be remembered for 18 years and there seems to have been very little change since then the owl appears to have more than held its own. Possibly the increase in human interference (the population has increased from nil to 150), has been offset by the reduction in the number of larger predators, particularly leopard, hyena and jackal. In 1956, at the base of an old olive tree in some open bush land, a pair of owls bred regularly. The bush was cleared and the land ploughed for crops and later a plantation of gum trees established. In 1969, an owl laid three eggs in the middle of this small plantation; so it would appear that even if the owl is disturbed, it will eventually re-establish itself in its old territory. From rather more superficial observations, this pattern would appear to hold good for the rest of Mau Narok district.

(g) Are there grounds for considering *B. capensis mackinderi* as a race of *B. bubo*??

Two owls, the Barn Owl, *Tyto alba*, and the Long-eared Owl, *Asio otus* (L.), both have Palaearctic and Ethiopian races; the former, with its wide ecological tolerance has spread throughout the continent, whilst the latter has a distribution in Africa similar to *B. capensis*, but even narrower. There seems to be sufficient evidence to consider the case of *B. capensis* being conspecific with *B. bubo* in the same way. Certainly if *B. b. ascalaphus* Savigny and *B.b. desertorum* Erlanger come under the nominate species, both birds of very

different habitat, size and plumage, it would seem consistent to include *B. capensis* as well. The illustrations by George Lodge of *mackinderi* in Meinertzhagen (1959) and of *B. bubo* in Bannerman (1955) show their similarity. In Nicoll's *Birds of Egypt* (1930) Meinertzhagen refers to *B.b. mackinderi* from Mt. Kenya, and adds that the *B.b. dillonii–B.b. capensis* group can also be treated as forms of *Bubo bubo*. In addition, Dr. Bannerman, at the end of his essay on the Eagle Owl, says... "the truth is that all the eagle owls are very closely related and an equally good case can be made out for allying some of the African species with *Bubo bubo*, though I think it is a mistake to do so." (Bannerman 1955).

The distribution records of *Bubo capensis* shown on map 1 in Benson & Irwin's paper shows a typical flight line of an east Palaearctic migrant following the Rift Valley down to the Cape. If the Cape Eagle Owl had established itself in very early times, one would expect an east-west picture covering other African montane habitats. It might be inferred that the bird had only recently become a resident breeder at the end of the last cold phase when less clement conditions prevented it spreading. It has been shown in this paper that the owl is well capable of holding its own under normal conditions, and one would have expected it to have spread at least to the Ruwenzori range.

A table is set out below to show differences and similarities between *B.b. bubo* and *B.c. mackinderi*. Abbreviations of references are: (B) for Bannerman (1955), and (W) for Witherby *et al.* (1941). (P & G) for Praed & Grant (1952) and (Will) for Williams (1967). Unmarked details are taken from this paper.

	B. bubo	*Bubo capensis mackinderi*
Size		
Female wing measurement in mm.		
(*B.b. bubo*)	max 495 av. 458	
(*B.b. ascalaphus*)	max 430 av. 387	max. 428 av. 402
(*B.b. desertorum*)	max. 372 av. 349	
Colour		
Above:	Mottled blackish and tawny (W) Black and reddish brown (B)	Blackish brown, mottled tawny (P & G) Mottled orange-buff, dark brown and white (Will)
Below	Fine, wavy bars, boldly streaked on breast (W)	Blackish and white blobs and bars, breast to belly (P & G)
"Ear-tufts"	Horned	Horned
Eyes	Deep orange (B)	Fiery-orange (Will)
Voice	Hoo-oh (B. p. 174) oo - oo - *oo* (W) (*ascalaphus*) u - huuu (Meinertzhagen)	Hooo - hu uh - hooo
	Kveck kveck (B. & W) mewing (B)	wak wak mewing
(nestlings)	cleeee - clee - clee (B)	kleeeeee - kleeeee
Display	Song duet, one bird bowing to other (B)	Ditto
Nest	Ground, on hillside, cliff etc. hollow scratched out of ground (B) (ditto W. plus sometimes old bird of prey nests).	Ground, on riverbank slope etc.
Eggs	White, av. size 59.8 mm × 49.7 mm (W) Clutch size 2 -3 (W)	White, av. 57.5 mm × 45.4 mm. Clutch size 2 - 3
Incubation	35 days, brooding by female	36 days, brooding by female.
Fledging	6 - 7 weeks (B)	6 - 7 weeks
First flight	8 weeks (B)	7 - 10 weeks
Food	75 per cent small rodents plus birds, fish and beetles (B)	mainly mole-rats, hyrax, plus birds crabs and beetles
Pellets	Size 126 × 41 mm 93 × 31 mm (B)	95 × 30 mm 98 × 40 mm
Habitat	. . . cliffs, ravines and rocky ground in wooded and open country (W) River gorges (B)	See text. high altitude . . . . in habits rocky cliffs and escarpments, and hunts in more open country. (Will).

Distribution	Very common where conditions suitable as in Spain and Norway (over 1,000 killed annually for many years). (B)	See text
Habits	Sedentary (B & W). Younger birds wander (B) Largely nocturnal (B)	See text
	Does not mind full daylight (W) See also Bannerman pp. 172 - 179 Vo. 4.	

There may be morphological or anatomical discrepancies unknown to the writer which invalidate these comparative similarities, but otherwise the two species seem to be so remarkably alike as to warrant a review of their systematics.

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To Elizabeth Nicoll I record once again my appreciation of her typing. Finally I wish to thank my fellow-farmers of Mau Narok, who with their wives and children reported their observations on Mackinder's Owl over the years; and especially my wife, Vanda, who reared the owlet with such care and also contributed a great deal of information.

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VIDUA FISCHERI (REICHENOW) PARASITIC ON *GRANATINA IANTHINOGASTER* (REICHENOW)

By

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A nest of *Granatina ianthinogaster* was found on 11 April 1970 in a low thorny bush, in long grass by the roadside, at mile 30 from Nairobi, Kenya, on the road to Ololkisaili: a generally dry area of grass and acacia thorn. A male bird was seen entering the thorny bush carrying a guineafowl feather and emerging later without it. The nest contained five eggs which were not examined. On 18 April 1970 the nest contained small chicks and on 25 April 1970 nestlings, which were examined, one of these had a brown rump and tail and the other four had purple rumps. Field notes were made of plumage and gape patterns. On returning later the same afternoon the area around the nest had been trampled by cattle and the bush almost flattened. A search revealed a rather mangled nest but fortunately the five nestlings appeared unhurt and they were taken in the hope that they could be hand-reared. It was suspected that the odd nestling was *Vidua fischeri* and, as the bird was raised to three months old, identification was confirmed.

The nestlings were taken to Nairobi in the nest and on closer examination, the nest and nestlings were found to be swarming with mites. There was no nest hygiene and the entrance and base were badly fouled. The nest was originally lying horizontally and almost on the ground. It was roughly a lemon-shaped mass with a longish entrance spout, constructed mostly of fine grass and lined with feathers. Evidently when first found the male was bringing feathers to the nest after the eggs had been laid (see Friedman 1960).

Neunzig (1929, not seen) but quoted by Payne (1970) described the mouth markings of *V. fischeri* "as generally similar to the mouth markings of the presumptive host, *Granatina ianthinogaster*, with the exception of the greater extent of a U-shaped black mark on the lower mandible and the presence of two small spots on the posterior portion of the palate in the host". Friedmann (1960) reproduces Neunzig's figure. However, this description and the figure is incorrect for *G. ianthinogaster* and fits more closely *G. granatina* (Linn.) and as Friedmann remarks "his description requires verification". It seems from my living specimens that Neunzig did not have definite examples of either species or specimens in good enough condition to describe and figure these markings.

The following is a description of the mouth markings of living nestlings and two month old fledglings of *V. fischeri* and *G. ianthinogaster* on which notes have been made at regular intervals. (See drawing). In *G. ianthinogaster* the beak is black, larger and heavier than that of *V. fischeri*. Inside on the upper palate there are three jet black spots in triangle formation on a greyish salmon-pink background with more intense orange-pink between the spots forming a clear H-pattern. The pink colour fades with age. The naso-pharyngeal cavity in *G. ianthinogaster* is edged by a series of inward and backward

projecting spines. In *V. fischeri* the pattern is similar but the three spots are paler, greyer and not quite the same shape. The lower palate in both species is an intense deep, blue-black: the tongue is long and narrow, black, with white edges and the white distal lobes are finely serrated at the edges: the gape tubercles of both species are identical, the upper brilliant electric-blue and the lower smaller, and irridescent white. At three months there was very little change in colour or pattern except that markings were duller and the gape tubercles much reduced.

The colour pattern of the nestlings and fledglings stages show a very close similarity. When rescued three *G. ianthinogaster* and the *V. fischeri* still had tufts of down on the head. There was a size discrepancy amongst the nestlings. One *G. ianthinogaster* was very much smaller than the other three; the *V. fischeri* was the largest. The heads of all were uniformly coloured a warm chestnut brown, contrasting with the back, wings and breast which were duller. The main difference between the species was in the tail and rump colour. *V. fischeri*, has in addition, a pale almost white belly and undertail coverts, whereas these areas are only slightly paler than the breast in *G. ianthinogaster*. Another obvious difference was that the feet and legs of *G. ianthinogaster* are bluish-grey (lighter than slate) slender and with longer toes than those of *V. fischeri*, the legs of which are brownish-grey and stout. The eyes of both species are very dark brown, almost black. At three months there was little difference in eye colour. At three months, when confirmation of the identification of the *V. fischeri* was fully established, the belly and undertail coverts were in strong contrast to the breast and the rest of the plumage, being almost white. The edges of the beak of *V. fischeri* were turning pinkish-red while in *Granatina* the beak was still black.

Feeding the youngsters at first presented a problem but de-winged termites dipped in a proprietary vitamin-mineral compound*, were readily taken on the second day. On the third day the youngsters were calling, a plaintive, repeated "sip-sip": that of *V. fischeri* being deeper and harsher. They would react to an imitation by begging for food which was always taken with the head lowered, twisted to one side, looking upwards and clearly exhibiting the mouth markings. *V. fischeri* would also lower and flutter one or both wings. The slowest to learn to take food was *V. fischeri*. However at twenty days it commenced to pick up grain but would still take proffered food and at twenty-five days it became independent, taking only grain.

Obvious territorial behaviour was noted with the adult birds at Ololkisaili. A male *V. fischeri* takes over a territory and drives off any intruding *Vidua* spp. At one location this was very noticeable, as it included a water hole which was visited by many species. From time to time, other *V. fischeri* and *V. macroura* (Pallas) visited the water hole, these were always attacked and driven off. Each male appears to have two or three females in attendance and the male chivvies these. Courtship display was seen on several occasions and at very close range. The male perches beside or opposite the female, bounces up and down, at the same time rapidly flaps or claps its wings, which are not fully expanded. Just how the sound of clapping was produced was not established. The male would also carry out this clapping while hovering almost stationary in the air in front of the female. Flight is somewhat undulating usually only over short distances when the male would alight on the extreme top of some bush or tree.

Singing has been heard and is difficult to describe but may be defined as a series of rather watery flute-like notes reminiscent of the song of *V. macroura*. Payne, (1970) (Pers. comm.) remarks "the overall tone is quite similar in the two species and without a tape-record to compare the songs directly it would be difficult to appreciate the difference".

Payne (pers. comm.), since this paper was originally drafted, has drawn attention to a paper by Nicolai (1969) "Beobachtungen an Paradieswitwen (*Steganura paradisea* L. *Steganura obtusa* Chapin) und der Strohwitwe (*Tetranura fischeri* Reichenow) in Ostafrika" *J. Orn. Lpz.* **110** (4) pp. 421-447 (1969).

Payne (*op. cit.*) notes that Nicolai does not describe or figure the lower half of the mouth of *V. fischeri*. Nicolai reports on his work in Northern Tanzania and his findings of definate evidence of specific parasitism are now confirmed for the first time from Kenya.

In view of recent proposed changes in nomenclature with which the writer is not in agreement, the genus *Granatina* is preferred and maintained and not *Estrilda* of White (1963) or *Uraeginthus* of Hall and Moreau (1969) while *Vidua* is maintained instead of *Tetranura*, as used by Nicolai (1969).

*Proprietary product="COMPLAN", Glaxo Laboratories Ltd.

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THE LESS COMMON PALAEARCTIC MIGRANT BIRDS OF KENYA AND TANZANIA

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INTRODUCTION

The three East African countries of Kenya, Uganda and Tanzania are justly famous for their rich avifauna which includes approximately 150 species which visit the area from the Palaearctic Region as well as a large and varied Ethiopian element. The ornithological literature pertaining to the area is surprisingly sparse; the present paper is an attempt to clarify the distributional knowledge of the less common Palaearctic migrants.

The most widely used reference work covering the three countries is that of Mackworth-Praed & Grant (1957, 1960) although this book deals with several extra-limital territories as well as East Africa proper. A serious limitation of Mackworth-Praed & Grant is that very few definitive records are given. The most useful reference dealing with Kenya and Uganda is Jackson (1938); Jackson's distributional notes are based upon recorded specimens which, although not usually dated precisely, can frequently be located in the earlier literature or in museums. Tanganyika (mainland Tanzania) and Zanzibar were excluded from Jackson's work although Moreau produced a most excellent account of all the migrants to Tanzania at about the same time (Moreau 1937). Definitive records for the three countries were brought up to date therefore, to just before the Second World War. Since that time the birds of East Africa have been poorly documented, in marked contrast to those of Zambia which have received detailed attention by several workers, especially by C. W. Benson.

The two field guides by Williams (1967, 1969) contain many interesting distributional data which are not given by earlier authors. He gives no definitive records in these books (they would be out of place in field guides) but some have been supplied to us subsequently (Williams *in litt.*). Some too are to be found in the literature which appeared after Mackworth-Praed & Grant (*op. cit.*) was compiled.

PLAN AND SCOPE

We are unable to give a precise definition of a "less common Palaearctic migrant" as our choice has been made on the basis of personal experience, mainly in Kenya. For example, although a bird may be called "regular to East Africa" in the standard works we have obtained few, sometimes no, personal records during the last eight years; such a species will be included. Some species included may be regular or even common in areas which we have seldom or never visited, in particular Lake Rudolf, Marsabit and Ol Bolossat, all in Kenya. Identification difficulties are probably less important nowadays because mist-nets are used widely, and are especially useful for species with skulking habits.

Originally we had intended to cover all three East African countries, although our personal experience of Tanzania is slight, and only C. F. M. has any substantial knowledge of Uganda. As Mann (1971b) has already published his more interesting Uganda records and D. J. Pearson (pers. comm.) is preparing a paper on Palaearctic migrants to Uganda, data from that country are mentioned only when they are especially significant. Despite our lack of personal experience of Tanzania, and the inevitable Kenya bias, we have attempted as much as possible to give equal weight to the two countries in this paper. Tanzania lies directly to the south of Kenya, so that Palaearctic birds recorded in Tanzania will, in most (but not all) cases, have passed through or over Kenya. That part of Kenya in the northern hemisphere is comparatively neglected ornithologically, whereas most of Uganda lies north of the equator, so that extralimital species stand more chance of being noticed in Uganda. Nevertheless, only three Palaearctic species *Porzana parva* (Scopoli), *Larus ichthyaetus* Pallas and *Apus pallidus* (Shelley), have been recorded in Uganda but not from Kenya or Tanzania (White, Jackson 1938, Mann 1971b, Pearson 1971).

Each entry in the systematic list is usually arranged as follows: a brief statement giving the distribution according to Vaurie (1959, 1965) and White (1960, 1961a, b, 1962, 1963, 1965) followed by a more detailed appraisal of the species' status with definitive records known to us. (To save constant repetition, dates of publication are not given for references to Vaurie and White (*op. cit.*) in the text.) In addition to searching the literature we have examined material in the National Museum, Nairobi and the British Museum (Natural History), excepting the raptors in the latter collection which were not available to G.C.B. in the summer of 1971. We also asked for unpublished records from ornithologists by advertising in the *East Africa Natural History Society Newsletter* (later renamed *Bulletin*) and we are grateful to those people who responded (see Acknowledgements section). It is well known that many collections of Kenya birds have been made in the last decade or so which have not always been written up. We have not attempted to contact the various institutions in which these collections are housed but it is our hope that any especially interesting specimens of Palaearctic birds in this category will be published by others in the future, even though these may alter some of our conclusions. When no definitive record is available to substantiate a published account of the occurrence of a species, the name is put in square brackets. It may be that the relevant specimen is housed somewhere, but until the details are published, or further records become available, these species cannot be admitted, in our opinion, to the avifauna of Kenya or Tanzania. Likewise a few sight records with insufficient documentation. Nomenclature follows White whereas order follows Backhurst & Backhurst (1970). Names of the seasons are used in the north temperate sense as we are dealing with birds which breed in that area. Records are usually listed in the order autumn-winter-spring.

No "official" up-to-date list of East African birds exists. Future list compilers will, we hope make use of this paper as a basis for evaluating the less common Palaearctic species. It should be noted that the records quoted by us belong to several different categories, namely: specimens which can still be examined; specimens which can no

longer be traced; photographs of birds in the field or in the hand; fully documented sight records (including birds handled for ringing but not photographed); sight records without full details. In our search of the literature, and in the replies received to our requests for records, we have come across a number which are a mere statement that the bird was seen. In most cases these records have been listed here. It is appreciated however that many readers will find them unacceptable but, in the circumstances, we feel that we have no alternative but to publish them. We would like to make some recommendations for the future publication of unusual records: observers are urged to publish their observations as soon as possible, giving full details of plumage, calls (if any), date and place; comparisons with other species present should also be given. The *East Africa Natural History Society Bulletin* is a suitable place for reporting most records although the *Bulletin of the British Ornithologists' Club* may be considered more appropriate for 'first' records or for when photographs are to be included. We would deplore the publication of unusual records with no descriptive details, but often with the phrase appended 'the observer is familiar with the species in Europe'; such records cannot be assessed at a later date without giving offence to the observer. This criticism is true of some records supplied to us *in litt;* sometimes we have been able to obtain additional information from the observer but in other cases this has not been possible.

In our view, the idea that a national list should be based *only* on collected specimens is wrong, but we feel that some form of evidence, preferably photographic, should always be supplied.

Birds recorded after the 1970-1971 wintering 'season' are excluded, so that this paper includes no records after 30 June 1971.

SYSTEMATIC LIST

HYDROBATES LEUCORHOA (Vieillot) Leach's Petrel

Vaurie and White both mention its occurrence off the coast of West Africa but that there are no records from the eastern seaboard. White states that Red Sea records require confirmation.

There is only one record from our area, a bird found dead at Tiwi River mouth, south Kenya coast, on 8 February 1969 (Parsons 1969). Very few species of pelagic birds have been recorded from the East African coast and it is likely that this species is nothing more than a very rare vagrant. It would seem probable that hitherto unrecorded pelagics will be found in the future. The other Palaearctic *Hydrobates*, *H. pelagicus* (Linn.) may well occur extralimitally in East African waters as suggested by Mackworth Praed & Grant (1957). Pakenham (1939) has pointed out that despite the claims of earlier authors, there is no good record from Tanzanian seas.

[*BOTAURUS STELLARIS STELLARIS* (Linn.) Bittern

This race is not recognised by Vaurie although White admits it; both authors state that Palaearctic birds winter to the northern tropics, rarely to the Congo Basin.

We have no records from Kenya or Tanzania but the sight record by Schwarz (1948) from Laropi, West Nile Province, Uganda on 24 April 1948 may be mentioned; the bird was recorded as a "Common European Bittern (*Botaurus s. stellaris*)" with no details except that it was seen in reeds. We know of no way of distinguishing the Palaearctic form from that of southern Africa (*capensis* Schlegel) in the field although, according to White, *capensis* occurs no further north than south-western Tanzania. We consider Schwarz's record unsatisfactory because a) he has made no attempt to explain his reasons for calling it the nominate form, and b) he gives no details of the bird whatsoever. There seems no reason, however, why this species should *not* occur occasionally in northern East Africa, especially as Urban & Brown (1971) record it as a rare visitor throughout Ethiopia. It may be mentioned that the closely related American Bittern *B. lentiginosus* Montagu has wandered to western Europe on a number of occasions so that vagrancy may be a regular trait in the genus. Vesey-FitzGerald & Beesley (1960) record the species as a Palaearctic migrant to the Rukwa, south-western Tanzania, but add that it possibly breeds, having heard booming in February and March. Clearly this refers to *capensis*. Thus the European Bittern has not been recorded from Kenya or Tanzania.]

IXOBRYCHUS MINUTUS MINUTUS (Linn.) Little Bittern

Recorded by Vaurie and White as wintering in tropical Africa, especially in the east, south to eastern Cape Province.

Jackson (1938) was able to give only one record of one obtained (others seen) at Witu, Kenya coast on 12 May. Van Someren (1932) stated that "the typical race occurs as a migrant" but gave no details. There are five specimens in the National Museum:

25 December 1970, ♂ Nairobi — February 1946, ♀ Lake Magadi
28 December 1959, juv. ♂ Nairobi — February 1953, ♀ Dodoma, Tanzania
9 January 1963, ♀ Nairobi

In addition, one was ringed (P.L.B.) on 21 November 1969 at Ukwala, Central Nyanza, Kenya, weight 91g, wing 150 mm.

The dates of the above birds suggest that it is a winter visitor rather than a passage migrant in our area. Probably the European Little Bittern is often overlooked due to confusion with the local race *payesii* (Hartlaub) and because of the difficulty in seeing birds in dense marshland vegetation.

CICONIA NIGRA (Linn.) Black Stork

Vaurie states that the species winters south to 15°S. whereas White is more cautious, giving the wintering range of the Palaearctic birds as south to Uganda. The Black Stork breeds south of our area in Malawi, Zambia and South Africa where it is apparently resident.

Benson *et al.* (1970) have shown that it is a regular migrant to Kenya in very small numbers between November and early April. This statement is based on nine sight records supplied by the late M. E. W. North, and our more extensive data confirm this view. We have details of 41 sightings between 1 September and 6 April of which all but two are from Nairobi and east of Nairobi. Most are from Nairobi National Park and Tsavo East National Park. J. G. Williams informs us (*in litt.*) that the mounted display specimen in the National Museum was collected by R. Glen at Kibwezi. Jackson (1938) was able to cite only two recorded localities in Kenya, both west of Nairobi and both on the authority of van Someren, implying that he (Jackson) had never seen the bird himself. This lack of records of such a conspicuous bird suggests that the Black Stork is more common now than it was in the early part of the century. Apart from van Someren's (1922) "large flock", the largest party is of twelve birds seen by Mrs. Lise Campbell in Nairobi National Park on 29 November 1970.

Sight records from Tanzania are: six at Rukwa in January (Vesey-Fitzgerald & Beesley 1960) and one annually in the Arusha National Park from 1965, to at least 1969, between October and March (Beesley 1971a). The only earlier references to this species from Tanzania are by Moreau. In the first (Moreau 1937), he makes a most uncharacteristic statement that it is "a winter visitor and passage migrant in much smaller numbers than the White Stork" with no details of specimens obtained or dates of sightings. Later (Moreau 1941), when listing ringed *Ciconia* spp. recovered in Tanzania, he mentions one which, according to the description given him, might have been *C. nigra.* We have been unable to locate details of this ringing recovery.

The Black Stork is thus a regular winter visitor to central and south-east Kenya in very small numbers; in Tanzania it occurs regularly, but in even smaller numbers.

PLATALEA LEUCORODIA LEUCORODIA Linn. European Spoonbill

Vaurie and White give the species' distribution as south to Uganda and Kenya with no indication as to its abundance.

Van Someren (1922) listed one specimen, a male taken on 15 February 1918 at Lake Naivasha, but then went on to say that "large numbers winter on the larger lakes", a statement which is quite unacceptable in view of subsequent knowledge. Jackson (1938) considered it (geographically) probable that the bird was an example of the small Red Sea race *archeri* Neumann. White does not admit *archeri* as a valid race although the bill measurements he gives (147-189 mm for *archeri* and 183-223 mm for *leucorodia*) indicate that most specimens could be separated. All records to date are from inland, and since we consider it rather unlikely that Red Sea birds would wander to inland East Africa (as far west as near Lake Albert in Uganda, Keith 1968), we prefer to regard these birds as Palaearctic.

The specimen recorded by Loveridge (1923) from Kilosa, Tanzania was later rejected by Friedmann & Loveridge (1937) as having been incorrectly identified. In addition there are four modern sight records:

April 1956, several, Ferguson's Gulf, Lake Rudolf (J. G. Williams *in litt.*)
28 August 1964, 1, Lake Naivasha (A.D. Forbes-Watson *in litt.*)
29 August 1967, 1, Lake Nakuru (A.D. Forbes-Watson *in litt.*)
23 March 1969, 1, Central Island, Lake Rudolf (D.A. Turner *in litt.*)

The European Spoonbill is clearly no more than a very rare vagrant to Kenya. Confusion with the local *P. alba* Scopoli is, however, possible.

[*ANAS ANGUSTIROSTRIS* Ménétries Marbled Teal

This species is included as it is mentioned by Lynn-Allen (1951). He says that "two were supposed to have been shot in the Kisumu area in 1941" and "In 1932, we shot an unrecognised duck on a swamp at Uplands, outside Nairobi, which might possibly have been of this variety". It has not been recorded in Ethiopia (Urban & Brown 1971) but Vaurie records it as occasional to Lake Chad. We cannot admit this species to the Kenya list on the present evidence.]

ANAS CRECCA CRECCA Linn. Teal

Vaurie and White record this species south to northern Tanzania with no indication as to its abundance.

Jackson (1938), on the authority of van Someren, records it from Lakes Elmenteita, Naivasha and Nakuru, and from Solai. Van Someren (1932) gives the first East African record as 1 January 1919 from Lake Naivasha, and then from April 1923 "every winter", presumably until about 1931. G. R. Cunningham-van Someren (*in litt.*) states that he has shot Teal several times on Lake Naivasha and at Ol Bolossat between December and February from 1935 to 1955. In addition, Lynn-Allen (1942) obtained two on 22-26 December 1941 at Ferguson's Gulf, Lake Rudolf. Moreau (1937) gives van Someren's (1931) Tanzania records as being from Lakes Natron, Manyara and Eyasi.

The National Museum contains five specimens, all collected between January and March; four are from Naivasha and Rumuruti, the fifth, an adult male date 27 January 1961, is from Itumba, Tanzania. We know of only five sight records from Kenya, between November and March, and one from Tanzania, namely three birds at the Ngorongoro Crater Lake on 14 February 1967. (D. A. Turner *in litt.*).

The Teal is thus a scarce but perhaps regular migrant to Kenya with an odd bird straggling to Tanzania.

ANAS PENELOPE Linn. Wigeon

Vaurie gives its winter range as south to about the equator while White records it to northern Tanzania.

The distribution of the Wigeon in Kenya and Tanzania is very similar to that of the Teal except that the present species appears to be slightly more numerous. There are five specimens from Kenya in the National Museum taken between 10 December and 24 February at Naivasha (three), Njoro and Taveta. We have five personal sight records (all G.C.B.), four from the Kenya Meat Commission pools at Athi River between 6 February and 11 April, and another record of *c.* 20 on 25 January 1970 in the north-eastern corner of Lake Nakuru. A. J. Deane (*in litt.*) saw and photographed one at the end of November 1970, also at Lake Nakuru.

The party of 25 between 2 February and 7 March 1943, 40 km south-west of Mt. Meru, Tanzania in Fuggles-Couchman & Elliott (1946) is larger than any recorded in Kenya. The only other Tanzania records are those of J. S. S. Beesley (*in litt.*) from Arusha National Park, where he has observed them regularly during the winter on a small dam between January 1965 and 12 April 1971; the largest party was 15 birds on 12 February 1966. Moreau (1937) omits the Wigeon from his list of migrants to Tanzania and Grote (1930) gives the Sudan and Ethiopia as its southern limit, however it is clearly a regular visitor to northern Tanzania.

ANAS PLATYRHYNCHOS Linn. Mallard

Vaurie records the species south to Ethiopia and White adds that records from further south than northern Sudan are doubtful.

Some doubt must surround the status of the Mallard in East Africa. Sharpe (1930b) recorded the species from Marsabit but merely wrote "I think I am the first to record it from Marsabit in Kenya Colony" that is, he omitted to give any details of his record(s) at all. Van Someren, in his 1930 paper dealing with ducks makes the following statement: "Sharpe writes 'I shot a male on Marsabit Lake in February 1928. Both males and females at the end of January and in February 1929. One male in full plumage; young males and females, shot on different occasions and observed at other times' ". Van Someren also mentions that the species has been shot by Sharpe on Koronli Water WNW of Marsabit and goes on to say that Sharpe, being unaware that the Mallard was previously unrecorded in Kenya, did not retain any skins. Later, van Someren (1932) appeared sceptical, saying that "the record should be substantiated by a specimen". Grote (1931) quoted Sharpe's record without comment. Lynn-Allen (1951) mentions a drake (from a pair) shot on Lake Naivasha by Major Allan North on 26 December 1938 "destined for the Coryndon Museum in Nairobi, but unfortunately miscarried".

A number of Mallard have been introduced on private waters in Kenya (Lynn-Allen 1951 and personal observations) and J. G. Williams (*in litt.*) tells us that the late Raymond Hook released some at Nanyuki.

The Mallard occurs rarely throughout Ethiopia above 1500 m (Urban & Brown 1971) so it may be expected again in the north of Kenya. There are no records from Tanzania. The inclusion of the Mallard in the avifauna of Kenya thus rests on the specimens obtained by Sharpe and North, none of which is extant; the species should be watched for especially in the north of Kenya.

ANAS STREPERA STREPERA Linn. Gadwall

Recorded by Vaurie and White as south to Kenya. The Gadwall was not included by Jackson (1938) and it appears that the first Kenya specimen was obtained at Soy in December 1937 (van Someren 1943) followed by another in January 1938 from south Kavirondo (van Someren *op. cit.*). Copley (1942) records a female shot on 19 February 1940 at Kisumu and this specimen is still in the National Museum. Leakey (1943b) mentions three Gadwall specimens received by the National

Museum between December 1942 and January 1943 and one, a female, 9 January 1943 Lake Nakuru, still in the Museum, is probably one of these. In the extreme north of Kenya at Todanyang one was obtained from a party of four on 10 January 1942 (Lynn-Allen 1942). We have no personal sight records from Kenya but G. R. Cunningham-van Someren tells us (*in litt.*) of one which was present on a dam at Karen from December 1960 until January 1961. The sole record from Tanzania is of three seen (C.F.M.) on 18 December 1964 on Ngorongoro Crater Lake.

The above records show that the Gadwall is an extremely scarce bird in Kenya and Tanzania, however, it should be remembered that the bird may appear rather drab and inconspicuous in the field so that it may be more common than the records suggest.

AYTHYA FERINA (Linn.) Pochard

Vaurie and White give the winter range as south to the Sudan and Ethiopia. We have only one record of this species, a male seen and photographed between 2 January and 8 February 1971 on a dam in Arusha National Park, Tanzania (Beesley 1971b). There are no Kenya records but M.P.L. Fogden informs us (*in litt.*) that he has recent records for the Queen Elizabeth Park, Uganda.

The Pochard is thus a very rare visitor to our area, at present unrecorded in Kenya.

AYTHYA FULIGULA (Linn.) Tufted Duck

Recorded by Vaurie as occasionally to northern Tanzania and by White as a vagrant to northern Malawi.

Although Vaurie and White make no mention of the numbers involved our findings are otherwise in agreement with theirs: the first record is of one obtained on 21 November 1913 at the Yala River Swamp (van Someren 1922). By 1932 van Someren had six specimens from Lakes Naivasha, Elmenteita and Nakuru, and mentioned that A. Turner had noted them as regular on the Kinangop dams (van Someren 1932). Although we have no personal sight records of this conspicuous bird from Kenya, we can supply five by other observers: Marsabit Lake between November and March (H. B. Sharpe in van Someren 1930); Lake Nakuru, 11 December 1970 (A. J. Deane *in litt.*); Ol Donyo Sabuk, 5 January 1967 (MS in E.A.N.H.S. file); Lake Naivasha, 1 March 1970 (G. R. Cunningham-van Someren *in litt.*); Lake Naivasha, 19 March 1950 (Guggisburg 1950). Further, Cunningham-van Someren tells us (*in litt.*) that he has seen Tufted Duck in odd years on Lake Naivasha and Ol Bolossat between 1934 and 1965.

The only records from Tanzania are sightings from the north of the country: Ngorongoro Crater, 7 March (Fuggles-Couchman & Elliott 1946); Arusha National Park (J. S. S. Beesley *in litt.*) from 24 April to 1 June 1969 (male), 18-24 January 1970 (male), and from 19 December 1970 to 2 March 1971 (3 males, 2 females).

The Tufted Duck can be no more than a very scarce winter visitor to our area.

AYTHYA NYROCA (Güldenstädt) White-eyed Pochard or Ferruginous Duck

Both Vaurie and White record the species as migrating south to Kenya but with no indication of its frequency or abundance.

Jackson (1938) gave no records from Kenya although van Someren (1930) had recorded two (presumably obtained), both in January 1920 from Lakes Naivasha and Nakuru; later van Someren records two more, a female in February 1925 and one (no sex given) in January 1930, both from Lake Naivasha. The only recent specimen is of one shot on 8 February 1970 at Endebess (R. C. Boy *in litt.*) and we know of only one sight record, on the rather early date of 6 September 1958 at Ol Joro Orok (Bednall 1959). We have no personal records of this species and know of none from Tanzania.

The White-eyed Pochard is a very rare vagrant to Kenya although it may be overlooked to some extent.

TADORNA FERRUGINEA (Pallas) Ruddy Shelduck

Vaurie gives the winter range in Africa as south to the northern Sudan and White adds that it is a vagrant to Eritrea. Mackworth-Praed & Grant (1957) mention Kenya as the southerly limit of the non-breeding range and this is repeated by Bauer & Glutz von Blotzheim (1968).

The only record from our area is of one seen north of Ferguson's Gulf, Lake Rudolf in the late 1950s (J. G. Williams pers. comm.).

ACCIPITER BREVIPES (Severtzov) Levant Sparrow Hawk

White gives but two records for the whole of the Ethiopian Region, one from south Sudan and another from Busenga in Tanzania. Although collected by C. F. M. Swynnerton on 1 December 1921 the Tanzania specimen was not included by Moreau (1937) as it was not correctly identified until examined by Morrison (1955). There is only one other record from the Ethiopian Region (Gangala na Bodio, Uele, Zaire, 3° 41′N., 29° 08′E., Wattel (1966)) so that, on present evidence, the Levant Sparrow Hawk can be regarded as an exceptionally rare visitor to the Ethiopian Region; it appears that its winter quarters are unknown (Vaurie).

ACCIPITER NISUS NISUS (Linn.) European Sparrow Hawk

While Vaurie gives its winter range as south to the Sudan and Ethiopia, White mentions that it occurs sparingly to Kenya and northern Tanzania.

On the records available to us the European Sparrow Hawk is clearly a rare bird in our area although it must be mentioned that *Accipiter* species are notoriously difficult to see, let alone identify. Jackson (1938) gives one record from the Lower Molo River on 2 February 1911 and there is an immature male in the National Museum, collected on 4 December 1928 on the Kinangop, 2440m a.s.l. which was reported by Leakey (1943a). Owre & Paulson (1968) collected a female near Loiengalani, Lake Rudolf; the authors omit to mention the date of collection but state that the specimen was assigned to the nominate race by Vaurie. The remaining Kenya records are sightings by L. H. Brown (*in litt.*) of three together on 21/22 January 1952 at Ishiara and of one on 23 January 1953 at Ruiru. The sole record for Tanzania is the female collected in November between Mts. Meru and Kilimanjaro quoted by Grote (1930).

Eagles of the genus Aquila: The following three species, together with the Steppe Eagle *Aquila rapax orientalis* Cabanis, form a notoriously difficult group of birds to identify in the field. Thus, with the comparative lack of collecting in our area in modern times, we can add few definitive records. As Mann (1971b) has pointed out, the Steppe Eagle is a common visitor to Kenya, so that the bulk of Palaearctic *Aquila* seen are probably this species. We are unable to evaluate the true status of these species in East Africa; in our opinion *some* specimens are required. A number of observers in Europe are attacking the problems of bird of prey identification with great thoroughness (see, for example, Flight identification of European raptors, Parts 1 and 2 by S. Christensen, B.P. Nielsen, R. F. Porter & I. Willis *Br. Birds* **64:** 247-266 and 435-455); in future, when the effects of their studies become known, more acceptable sight records may be reported. It is distasteful to most people to collect birds of prey, especially now that many species are declining in numbers, so that any birds found dead should be taken for specimens or, if this is not possible, photographs and/or notes should be made so that the bird is not wasted.

AQUILA CLANGA Pallas Greater Spotted Eagle

Vaurie and White record it south to Eritrea; an old record from Natal is doubted by White. Urban & Brown (1971) describe it as "frequent to common" in the western highlands of Ethiopia, but add the remark "numbers and status rather obscure because of confusion with *A. rapax.*"

Owre & Paulson (1968) collected an immature female at El Molo Bay, Lake Rudolf on 19 October 1958, the identification was confirmed by Stresemann and Vaurie. A. D. Forbes-Watson (pers. comm.) tells us of a bird which he saw at Ngulia in Tsavo West National Park on 3 December 1969. He showed his description to L. H. Brown who agreed that the bird was *A. clanga.* A. J. Deane (*in litt.*) has seen and photographed this species on three occasions at Lake Nakuru (20 November 1970, 5 and 7 December 1970). Finally, Bednall (1959) claimed a "possible" on 10 November 1958 in Nairobi National Park; J. G. Williams is quoted as agreeing that it was probably this species. The Greater Spotted Eagle is unrecorded from Tanzania.

AQUILA HELIACA HELIACA Savigny Imperial Eagle

Both Vaurie and White record the nominate eastern race of the Imperial Eagle south to the Sudan. Urban & Brown (1971) describe it as uncommon in the western highlands of Ethiopia, but add the remark "no recent records; status rather obscure".

There are two Kenya sight records. The first was seen by G. H. H. Brown on the Yatta Plains in February or March 1962 (Brown 1963). The author omitted to mention exactly where or when he saw the bird but his brother, L. H. Brown, has supplied us (pers. comm.) with the information given above. A second bird was seen by A. D. Forbes-Watson on 4 December 1969 at Ngulia where he had seen a Greater Spotted Eagle *A. clanga* only the day before. As with this earlier bird, the description was shown to L. H. Brown who agreed with the identification (A. D. Forbes-Watson pers. comm.).

AQUILA POMARINA Brehm Lesser Spotted Eagle

Vaurie and White record this species as a non-breeding migrant to our area and south to Rhodesia and South West Africa. White remarks that it is evidently overlooked here as it is common in Rhodesia.

The Lesser Spotted Eagle is uncommon in the northern Sudan (Cave & Macdonald 1955) but it has never certainly been recorded from Ethiopia (Urban & Brown 1971), so that it probably passes mainly west of our area. There is still, as far as we know, no record from Uganda or Zaire; Jackson (1938) gave only one from Kenya, the bird collected by Mackworth-Praed (1917) in the Ithanga Hills north of Nairobi on 29 September. Lynes (1934) collected a female on 14 March 1932 at Iringa and saw 30, 150 and 100 passing north on 12th, 13th and 14th of that month. A bird ringed in Estonia was killed in Geita District, Tanzania in March 1955 (Jogi 1957). There is no specimen in the National Museum, and the only recent record is that of Bowles (1967) of thousands of eagles near Sultan Hamud, Kenya on 11 November 1966 which L. H. Brown thought *might* have been this species.

The route taken by this species to its winter quarters remains, to some extent, a mystery. Brown & Amadon (1970) note that most enter Africa at Suez to spend the winter in savannas south of the equator. Their map 66 shows the main wintering area as eastern Africa between about 5°S. and 20°S. Certainly it is regular in some numbers in Rhodesia and Zambia (White,

Benson *et al.* 1971) but is hardly known in our area; from the wintering range given by Brown & Amadon (*op. cit.*) there should be records from southern Tanzania more recent than those of Lynes (*op.cit.*) in 1932, but this lack of modern records may simply reflect the absence of bird watchers there at the right time of year. The most obvious gap in our understanding of this species' movements is the route taken between the southern tropics and the northern Sudan. It no doubt passes regularly *over* our area, as discussed in Brown (1970), coming to ground only exceptionally. Properly identified birds are so few that we are unable to discern any clear pattern or route.

BUTEO RUFINUS RUFINUS (Cretzschmar) Long-legged Buzzard

Vaurie and White record this species south to northern Sudan, and occasionally to northern Somalia and Zambia (Kasama). Benson (1948) first reported the Kasama bird, a male collected by E. L. Button on 21 November 1938. Button presented the bird to the British Museum but Benson (*in litt.*) informs us that it disappeared soon afterwards, and that it has still (1971) to be located. Benson (*in litt.*) considers his earlier identification entirely correct. Although not included for Ethiopia by White, Smith (1957) had recorded it earlier from the extreme north (Eritrea), and Urban & Brown (1971) mention sight records and a specimen from elsewhere in Ethiopia; they record it as uncommon throughout the country. There are only two records from our area: Owre & Paulson (1968) collected a male near Loiengalani in northern Kenya on 6 November 1958, and L. H. Brown (*in litt.*) informs us that he saw one on 23 November 1966 at Block's Farm, near Longonot. The Long-legged Buzzard may be regular in small numbers in the north of our area. At 10°S., the Kasama record is some 1700 km south of any other record; it can be no more than a very rare vagrant south of northern Kenya, and, as yet, is unrecorded from Tanzania.

CIRCAETUS GALLICUS (Gmelin) Short-toed Harrier Eagle

White states that it has occurred once on Mt. Elgon but he omits to say in which country the bird was found (the Kenya—Uganda border bisects the mountain). The only record definitely from our area is the female collected near Loiengalani in northern Kenya on 27 October 1958 (Owre & Paulson 1968), so the species may well be regular in small numbers in the extreme north of Kenya. Urban & Brown (1971) record this species throughout Ethiopia from October to March but add (by using a question mark) that the status is uncertain.

HIERAAETUS PENNATUS (Gmelin) Booted Eagle

Although this species migrates as far south as Cape Province (Vaurie and White) it is nevertheless a rarely observed bird and is, therefore, included in this paper.

Broekhuysen (1971) was able to give only three sightings for South Africa for the seventeen years 1950-1966, but all in 1961. It is known from Malawi and there are four sight records from Zambia (Benson *et al.* 1971). A full list of Kenya records is given indicating the colour phase of the bird, where known. W. Leuthold supplied his records *in litt.*, mainly from Tsavo East National Park.

28 July 1970, 1 seen Lessos, C.F.M.
18 November 1963, ♂ dark Rongai, National Museum
February, Ol Donyo Sabuk, Grote (1930)
16 February 1971, 1 light seen Manyani, W. Leuthold
7 March 1971, 1 light seen 8 km north of Eldoret, P.L.B., C.F.M.
12 March 1971, 1 light seen Tsavo Gate, W. Leuthold
17 April 1926, ♂ Mt. Elgon, Granvik (1934)
24 April 1971, 1 dark seen Shimba Hills, C.F.M

Further records will show whether 1971 was an exceptionally good year for Booted Eagles and whether the pattern of occurrence, with most records in the south-east and most in spring, is merely coincidence. The only Tanzanian records are of one collected at Amani on 26 January 1930 (Sclater & Moreau 1932) and one seen by J. S. S. Beesley (*in litt.*) at Tarangire in October 1966.

PERNIS APIVORUS (Linn.) Honey Buzzard

Vaurie and White give its winter range as south to Angola, the Transvaal and Natal.

Moreau (1937) comments that the Honey Buzzard is not uncommon and that it occurs at Amani, Tanzania each year in February and March, and J. G. Williams (*in litt.*) states that it passes through Kilifi, Kenya coast in small numbers every spring, normally in late March and early April. In contrast to these views L. H. Brown (*in litt.*) has seen this bird only once in Africa (and that in 1971 after over 30 years residence) while we have but two personal sightings (see below). Jackson (1938) also found the bird scarce with no records from Kenya and only one from Uganda, although van Someren (1922) had recorded it earlier from the Yala River and Nairobi. We are aware of only fifteen definitive Kenya records:

29 October 1970, 1 seen Kapsabet, C.F.M.
31 October 1947, 1 seen near Elmenteita, Leakey (1947)
2 February 1954, ♂ near Nairobi, National Museum
7 March 1966, ♀ Lower Kabete, Nairobi, National Museum
14 March 1964, ♀ Langata, Nairobi, National Museum

28 March 1971, 1 seen Lower Kabete, J. S. Karmali and S. Keith (*in litt.*)
April 1938, Kabete, Leakey (1943)
1 April 1963, ♀ Nairobi, National Museum
4 April 1971, 1 seen Karen, Nairobi, L. H. Brown (*in litt.*)
11 April 1959, 1 seen Mtito Andei, J. G. Williams in Bednall (1959)
25 April 1970, 1 seen Thika, C.F.M.
4 June 1932, ♀ Ruaraka, Voous (1948)
10 June 1963, immature Ruiru, National Museum
19 June 1930, ♀ Nairobi, Voous (1948)
2 July 1944, 1 seen Indarugu River, Blom-Bjorner (1945)
28 August 1954, ♂ Kiambu, National Museum
We have details of five records from Tanzania:
8 November 1921, ♂ Ulugu, Ushora, Friedmann & Loveridge (1937)
29 December 1939, 1 seen Mwanza, Meiklejohn (1940)
23 February 1918, ♀ Morogoro, Friedmann & Loveridge (1937)
24 February 1934, ♀ Amani, National Museum
1 April 1918, ♀ Morogoro, Friedman (1922)

Moreau (1937) did not give any precise records although he collected the Amani bird; as mentioned above, he stated that it was not uncommon there each year in February and March.

The Honey Buzzard appears to be a scarce migrant, mainly on spring passage, with an unusual number of summer records.

FALCO AMURENSIS Radde Eastern Red-footed Falcon

Considerable confusion surrounds the status of this species in the literature: Vaurie and White give its *winter* range (our italics) as Kenya and the Congo (Katanga) south to Cape Province in the east and northern South-West Africa in the west. The Eastern Red-footed Falcon is an east Siberian breeding bird extending as far *west* as Lake Baikal (104°-110°E.), yet it winters exclusively in Africa (Vaurie). South of our area in Malawi, Zambia, Rhodesia and South Africa it is a common winter visitor and passage migrant, e.g. Benson (1951) recorded thousands going to roost in Malawi and Benson *et al.* (1971) mention 10000 or more together around Salisbury, Rhodesia. From the above records and from the paucity of records from our area (see below) and from the complete lack of records from the Sudan, Ethiopia and ex-British Somaliland (Cave & Macdonald 1955, Brown & Amadon 1970, Archer & Godman 1937) it seems clear that this gregarious species does not migrate overland from Siberia to Central and Southern Africa; moreover, the statement in Brown & Amadon (*op. cit.*) that it "possibly crosses the Indian Ocean from north-west India to about Cape Guardafui" must also be erroneous. Brown (1970) modifies his earlier ideas (with Amadon) by saying that "One must assume that they cross the Indian Ocean from North-East to South-West, arriving on the African coast at some part south of the Equator, when the rains are about to start or have started". From the evidence presented below we would agree with this statement except to add that the majority must *enter* Africa south of Tanzania, i.e. at more than 10°S., although in spring some *F. amurensis* are noted on passage in southern Tanzania. All our records except those from southern Tanzania must surely refer to stragglers.

We have been able to locate only six dated autumn records from the whole of our area (lending weight to the theory that the arriving flocks enter Africa south of 10°S.):
19 November 1961, 1 *c.*100 km from Arusha, northern Tanzania, National Museum
23 November 1966, ♂ seen Block's Farm, Longonot, L. H. Brown (*in litt.*)
24 November 1966, several ♂♂ seen, as above; no ♀♀ observed, L. H. Brown (*in litt.*)
25 November 1937, Pemba Island, Tanzania, Pakenham (1939)
25 and 26 November 1965, ♀ seen Lelan Downs, Cherangani Hills, L. H. Brown (*in litt.*)
2 December 1947, Karema, Lake Tanganyika, National Museum

In addition, Sessions (1967) considers it an uncommon passage migrant at Mau Narok (0°30′S.) in November and December.

We have rather more spring records:
24 February, specimen Mtito Andei, Jackson (1938)
26 March 1933, Manda, Lake Malawi, Tanzania, Sassi & Zimmer (1941)
27 March 1930, ♂ Koroli, near Marsabit, Oberholser (1945)
30 March, seen Amani, Tanzania, Moreau (1937)
March and April, frequently seen Rukwa, Tanzania, Vesey-Fitzgerald & Beesley (1960)
5 April, specimen Kikuyu Forest, Jackson (1938)
5 April 1971, *c.* 10 (at least 2 ♀♀) seen hunting flying termites after heavy rain, near Voi (in Tsavo East National Park) W. Leuthold (*in litt.*)
7 April 1971, 2 ♂♂ seen Kandere, Tsavo East National Park, C. Smeenk (*in litt.*)
24 April 1959, ♂ collected Kilifi, J. G. Williams in Bednall (1959b)
6 and 14 May 1968, ♀ seen Lower Kabete, Miss D. Angwin (*in litt.*)

Van Someren (1932) records it from Kikuyu and Loita without giving dates and Sessions (1967) calls it an uncommon passage migrant at Mau Narok in April. It is significant that Reynolds (1969) failed to record it in seven years residence at Tabora.

FALCO CHERRUG CHERRUG Gray Saker

White records the Saker south to Kenya but Vaurie gives only northern Sudan and Ethiopia. There is no mention of it in van Someren (1922), Grote (1930), Moreau (1937) or Jackson (1938); Mackworth-Praed & Grant (1957) give Kenya as the southern limit and Williams (1969) gives it as an uncommon winter visitor to north-eastern Africa without specifying the countries in which it has occurred.

The first East African record is of one obtained by M. G. K. Collins in Nairobi on 29 November 1948 (Williams 1948) and now in the National Museum. We know of a few Kenya sight records: 1 seen on 23 November 1966 at Lake Nakuru, A. D. Forbes-Watson & D. A. Turner *in litt.*; up to five together seen at Kabarnet from 7 November 1969 to the end of the month (C.F.M.); 1 seen at Kabarnet on 19 March 1970 and 27 April 1970 (C.F.M.).

Mann's records from Kabarnet in the Kenya Rift are especially interesting and suggest that it may have been overlooked elsewhere. He was resident there off and on for the whole of the 1969-70 wintering season so that their apparent absence from December to mid March may be real. All the records to date are in November, March and April, indicating a passage. In any event it can be no more than a very scarce visitor to Kenya, and it is still unrecorded from Tanzania.

FALCO CONCOLOR Temminck Sooty Falcon

We do not quote Vaurie and White for this species as Moreau (1969) has written an excellent review of its status, both as a breeding bird in north Africa and Arabia, and as a winterer in Madagascar and the eastern littoral of Africa from Kenya to Natal. He rejects Meinertzhagen's (1930) record of regular breeding in the Old Fort at Mombasa as "now generally disbelieved but ..... may all be based on wintering birds". His supporting evidence for stating that it winters in Kenya is the three specimens in the National Museum from Nairobi, Naivasha and Sabaki River, an undated specimen in Jackson (1938), and information supplied by L. H. Brown and I.S.C. Parker. Parker collected the Sabaki River bird on 20 November and considers it "a regular passage migrant in some numbers" through eastern Kenya. Brown has records from the lower Athi River and Lake Nakuru. In addition, D. A. Turner (*in litt.*) saw it near Suswa on 23 February 1969, and there is an immature female in the National Museum collected in the Lali Hills on 20 November 1960 not considered by Moreau. The only Tanzania records given by Moreau are Dar es Salaam (24 March 1894) and Ukerewe Island, Lake Victoria (undated). In his recent review, Moreau has ignored his own sight records from Tanzania between 26 October and 3 March which were doubted by Sclater (in Sclater & Moreau 1932); it may be that Moreau accepted Sclater's judgement as it is uncharacteristic of him to ignore such a relevant reference.

FALCO ELEONORAE Géné Eleonora's Falcon

This species breeds in the eastern Mediterranean and migrates through the Red Sea to winter in Madagascar and Réunion (Vaurie and White). Vaurie states that it *winters* in Somalia although White describes it as only a non-breeding migrant. More precisely, these authors refer to *ex*-British Somaliland which is the part of modern Somalia north of about 8°N.; likewise, Ethiopian records are from Eritrea in the north-east (Urban & Brown 1971).

There are no specimens of this falcon from our area but several recent sight records are given in full as a basis for considering any future records. There are no records in the literature for Kenya or Tanzania up to and including Mackworth-Praed & Grant (1957).

1. "Recorded in recent years as a passage migrant in the Ruaha National Park Tanzania" (Williams 1967).
2. "John Savidge, warden at Ruaha N. P. informs me this species is an annual visitor during December" (D. A. Turner *in litt.*).
3. "A 'certain' bird, perched at close quarters, seen near Manyara turn-off, south of Arusha (Tanzania), January 1971. Larger than a Hobby [*Falco subbuteo* Linn.] and bill and feet massive. Perched on small dead tree—long tail." (J. G. Williams *in litt.*).
4. At noon on 2 May 1971 at Naivasha, after heavy rain, G.C.B. observed three falcons which *may* have been Eleonora's, feeding at about 30-100m altitude on flying insects, probably termites. The most noticeable field character was their extremely graceful sweeping flight recalling large swifts (e.g. *Apus melba* (Linn.)). The only hovering performed was when they ate an insect which was held in the claws, as soon as this was done the majestic sweeping flight was resumed. The birds appeared like large Hobbies (not present for comparison) but with proportionately longer tails. The upperparts were slate-grey, underparts streaked, but with no rufous on 'thighs' or under the tail. There was no terminal bar on the tail and no 'moustache' was seen. The feet were yellow.
5. "At about 10.30h on 3 May 1971 a dark falcon, about Hobby size and shape but with proportionately longer tail, was seen flying steadily north along the western shore of Lake Nakuru. The underparts were rather dark, streaked black, and a 'moustache' was visible on the grey or whitish face. Cap and upperparts dark blackish." (D. J. Pearson *in litt.*). The observer feels that this *may* have been *eleonorae*.

The bulk of the population of this falcon must pass to the east of our area on their way to and from their known wintering grounds in Madagascar but a few may pass along the Rift Valley in Kenya and Tanzania.

FALCO PELEGRINOIDES PELEGRINOIDES Temminck Barbary Falcon

White treats *pelegrinoides* as a full species whereas most authors (e.g. Brown & Amadon 1970) treat it as a form of *Falco peregrinus* Tunstall, from which it cannot be certainly distinguished in the field. According to Brown & Amadon (*op. cit.*) it breeds in Nubia and North Africa as far west as southern Morocco, thus it does not certainly breed in the Ethiopian Region. Clapham (1964) believed that the birds which he saw breeding on the Dahlac Islands in the southern Red Sea were *pelegrinoides*, but for no reason except geography. He may well have been influenced by Mackworth-Praed & Grant (1957) wherein the map for this form indicates that it breeds to south of the Red Sea; these authors add, however, that "It has not yet been discovered nesting in our area". White records it to northern Sudan, northern Somalia and northern Ethiopia, "probably as a non-breeding migrant from the Palearctic but may breed". We include it in this review since there is still no concrete evidence that it breeds outside the Palaearctic Region. Owre & Paulson (1968) collected a female from two birds seen near Loiengalani in northern Kenya on 4 November 1958; the identification was confirmed by Vaurie. This is the only record from our area and may well remain so for a long time in view of the impossibility of recognising it adequately in the field.

FALCO VESPERTINUS Linn. Red-footed Falcon

Vaurie gives the winter range as from the equator south to Cape Province. White is more explicit, stating that it occurs south to Cape Province but "apparently not known from Eastern Africa from Ethiopia to Malawi". It is interesting that it should apparently by-pass eastern Africa on its way south when, although breeding as far west as Hungary, most of the population breeds to the north or north-east of our area. *Glareola nordmanni* Fischer takes a similar westerly route (see below).

To our west and south there is only one record from Uganda, at Moroto (Mann 1971b); no record in Zaire east of 28°E. (Chapin 1932); no record in Rhodesia east of 30°E. (Smithers *et al.* 1957); apart from the Nyika Plateau sight records, which also constitute the only Malawi records, it is unknown from Zambia east of Lusaka (Benson *et al.* 1971).

The sole record for Kenya is the male seen by D. A. Turner (*in litt.*) perched, and later flying at Elmenteita on 12 October 1968. In Tanzania, Vesey-Fitzgerald & Beesley (1960) consider it "rare" at Rukwa in the south-west, however, J. S. S. Beesley has told us (*in litt.*) that his only record for Rukwa (and for Tanzania) was of one female seen in mid April 1955 near Milepa Village.

Thus there are but two sight records of the western Red-footed Falcon from the whole of our area. The statement in Glutz von Blotzheim *et al.* (1971) that *vespertinus* is the dominant Red-footed Falcon from Kenya to South West Africa is, therefore, inaccurate.

COTURNIX COTURNIX COTURNIX (Linn.) European Quail

Vaurie gives its range as south to about the equator whereas White says that some also reach Natal and Cape Province. In a recent review, Benson & Irwin (1966) have rejected these southern African records so that they agree with Vaurie that it occurs south to about the equator.

Jackson (1938) records it from Kisumu, Athi, Loita, Ngong Road (Nairobi) and Mbuyuni near Taveta in Kenya. Benson & Irwin (*op. cit.*) mention specimens from Entebbe (Uganda) and Kisumu, both more or less on the equator, as the most southerly records. It is likely that Jackson's birds were correctly raced so that it probably wanders occasionally south of the equator to about 3°S. There is also the possibility that the migratory habits of the European Quail have changed since Jackson's day. Mrs. B. P. Hall (*in litt.*) tells us that most of Jackson's specimens are in the United States so that they would not have been included in Benson & Irwin's review (except for the Kisumu bird). It has not been recorded in Tanzania.

The identification of this Palaearctic race of the Quail is impossible in the field because of confusion with *C. c. africana* Temminck & Schlegel; we are aware of no modern records. As far as we know there is no Quail shooting nowadays in East Africa; Quail catching continues in Nyanza, western Kenya, but all birds caught are (in P.L.B.'s experience) Harlequin Quail *C. delegorguei* Delegorgue, and the catching season is from about June to September. There are no specimens of the European Quail from our area in either the National or British Museums.

CREX CREX (Linn.) Corncrake

The Corncrake may not be a 'less common' visitor to our area but we include it because it is so rarely observed, indeed the only observations (as distinct from specimens) we can trace are those of Beesley and Reynolds (see below). Vaurie and White give its winter range as south to eastern Cape Province.

Van Someren (1922) had specimens from Nairobi, Kisumu, Kiambu and Simba in December and April, and Jackson (1938) mentions a late bird obtained by Hinde in Nairobi on 2 June. For Tanzania, Moreau (1937) makes the broad statement that the Corncrake is "apparently known only from around the Great Lakes", but he gives no details of specimens or observations. We have listed all the Kenya specimens known to us (as mentioned above, we know of no sightings from Kenya), which show that the majority, if not all, occur at migration times, indicating that the Corncrake is not a winter visitor.

7 October 1960, ♂ Nairobi, National Museum
15 November 1948, Nairobi, Nattrass (1948)

16 November 1948, ♂ Kabete, National Museum
20 November 1962, ♂ Nairobi, National Museum
15 March 1940, ♂ Emali Hills, National Museum
22 March 1957, ♂ Thika, National Museum
29 March 1940, ♂ Garabani (=Emali), National Muscum
April 1950, ♀ Nairobi, National Museum
15 April 1919, ♂ Nairobi, Friedmann & Loveridge (1937)
16 April 1956, ♂ Lumbwa, National Museum
18 April 1952, ♀ Limuru, National Museum
23 April 1948, ♂ Nairobi, National Museum
26 April 1967, one much decomposed, Kabete, G.C.B.
27 April 1956, ♀ East Aberdares at 2700 m a.s.l., National Museum
29 April 1957, ♀ Nairobi, National Museum
early May 1916, "collected" Nairobi, Loveridge (1922)
2 June, "obtained" Nairobi, Jackson (1938)

There are two specimens (male and female) from Sanya, Tanzania in the British Museum collected by H. F. I. Elliott on 22 April 1946. Reynolds (1969) records it from the Ugalla River Game Reserve without details but he informs us (*in litt.*) that "Corncrakes seemed rather common judging from the number flushed by the car driving through . . . . . high grass"; this was in mid February. Reynolds has also told us that he has a few records of single birds seen from Iringa in March and early April. J. S. S. Beesley (*in litt.*) noted the species from 1 February until mid April in the Rukwa with up to four being seen in one day. He has also given us a record of one seen on 8 April near Lake Manyara.

We have been unable to throw much light on the question of the abundance or otherwise of the Corncrake in Kenya and Tanzania; it is a very secretive bird which is observed rarely, except when breeding. It is probably a regular migrant, occurring most frequently in spring. The high percentage of specimens from Nairobi and the Highlands of Kenya suggests that it favours the grass country of that area, but it may simply reflect the distribution of people interested enough to report a bird which has perished on migration.

[*FULICA ATRA* Linn. European Coot

We are grateful to C. W. Benson and R. J. Dowsett for drawing our attention to a note by Dathe & Faust (1965) where they claim to have seen this species in Tanzania; the following is a translation from the German: "During a safari . . . . to East Africa we saw, on 18 February 1965, independently of one another . . . . several hundred *F. atra* on the lake in the floor of Ngorongoro Crater. In spite of our special efforts we saw no *F. cristata*. Our wives witnessed our observations. Only when we looked at the literature and went through our notes at home did we see in Mackworth-Praed & Grant (1957) that *F. atra* only occurs in winter . . . . to the area of Khartoum." We are unable to accept this record: the knobs on the head of *F. cristata* Gmelin are rarely noticeable except at *very* close range. We think that the plate of *F. cristata* in the European Field Guide (Peterson *et al.* 1966) would suggest to observers from Europe that the projections on the head would be visible (if only in silhouette) at great range; in Africa this is not so: the coots which occur in thousands on, for example, Lake Naivasha look, *en masse*, just like the *F. atra* of Europe and, in any case, not all individuals have knobs on the head.

Urban & Brown (1971) consider it "frequent to locally common" in the Rift Valley and western highlands of Ethiopia, thus extending its known winter range considerably south of that given by White (northern Sudan and Senegal), however J. S. Ash tells us (*in litt.*) that "There must be an element of doubt about the Ethiopian Coots until I collect a specimen." The European Coot is a long distance migrant in parts of its range so that it may be proved to occur in the future in East Africa but, at present, we prefer to omit it from the avifauna of our area.]

PORZANA PORZANA (Linn.) Spotted Crake

The Spotted Crake is, like the Corncrake *Crex crex*, a highly secretive migrant recorded by Vaurie and White south to Lesotho.

Van Someren (1922) listed two adults, from Nairobi (April) and Londiani. We have seen the Londiani bird, a male, still in the National Museum and collected on 22 February 1913. Jackson (1938) mentions specimens from the Uasin Gishu Plateau and Kitui but gives no dates. A further specimen was obtained at Lake Elmenteita in November or December 1951 (Ridley & Percy 1953) and, more recently, one was trapped and ringed by D. J. Pearson at Athi River on 21 February 1971. The only Tanzanian records are from Kilosa on 14 April (Friedmann & Loveridge 1937) and Zanzibar (Grote 1930). Moreau (1937) summed up the situation by saying "almost certainly a passage migrant in some numbers and probably a winter visitor also", however the only specimen known to him from Tanganyika was the Kilosa bird mentioned above. The only East African specimen in the British Museum is an unsexed bird collected by Swynnerton on 22 April 1922 in Tanganyika (no locality). In contrast to the paucity of records from our area, Benson (1953) gives 28 specimens from Malawi, eleven of these in the British Museum were collected in February by Benson himself. It is recorded from six localities in Zambia (Benson *et al.* 1971). Chapin (1939) had no Zaire records but in his fourth volume (Chapin 1954) he mentions four specimens collected in that country by others.

It is not possible to evaluate the abundance of the Spotted Crake in Africa since it is so secretive and since it is likely to occur in swampy areas difficult of access. From the few records available it is likely that some winter in our area while others pass on further south.

BURHINUS OEDICNEMUS Linn. Stone Curlew

According to Vaurie and White, both nominate *oedicnemus* and *saharae* Reichenow occur as migrants south to Kenya; *saharae* has a partly African distribution in the breeding season, however it does not breed in the Ethiopian Region. The two races cannot be certainly distinguished in the field and, as sight records are likely to provide most future records, we have treated the species binomially.

Meinertzhagen (1922) obtained one at Kisumu on 15 January 1917 while van Someren (1921) collected two males at Meuressi, Turkana in January 1918, and in 1922 described it as a regular (but not common) winter visitor to East Africa, mentioning records from Kiambu and Lake Elmenteita in October and January, the latter possibly Meinertzhagen's bird. Stoneham (1930) noted the arrival of migrants at Rumuruti on 25 October and 20 December 1925 and 12 October 1928. Jackson (1938) recorded it from Elmenteita (van Someren), South Uaso Nyiru, Kerio River and Kisumu. The only modern records known to us are *c.* 10 at Eliye Point, Lake Rudolf on 29 March 1970 (C.F.M.) and of one seen at Lake Nakuru on 14 November 1970 (A. J. Deane *in litt.*).

There are thus rather few data available to assess its status but it is probably regular as a winter visitor to north-west Kenya. It has never been recorded in Tanzania or further south, and never *certainly* in Kenya south or east of Kiambu; the South Uaso Nyiro River flows south to Lake Natron on the Tanzania border at 2°S. but enters suitable country for this species at about 1°S. Although readily distinguished from the three Ethiopian *Burhinus* which occur in Kenya it is probably often passed off as one of these.

[*CHARADRIUS ALEXANDRINUS ALEXANDRINUS* Linn. Kentish Plover

A great deal of confusion surrounds the published winter range of this species. Vaurie records it south to tropical Africa and Angola, whereas White gives the southern limit as Avakubi in Zaire; neither writer specifically mentions Kenya or Tanzania although Vaurie's statement *could* include our area. According to Mackworth-Praed & Grant (1957) the Kentish Plover occurs throughout Africa in the non-breeding season but in a later paragraph the range in eastern Africa is given as "as far south as Tanganyika". Later they add that the bird is a rare visitor to the larger lakes of eastern African as well as to the coast. Williams (1969) describes it as a very uncommon non-breeding visitor to the East African coast.

Loveridge (1922) records this species from Dar es Salaam on 13 January 1919 but with no comment; we know of no other author who cites a precise date for this species, all make woolly statements not supported by published facts. Since Loveridge (*op. cit.*) made no comment at all about his Dar bird and since no one has ever published a definitive record of the Kentish Plover for East Africa (or even quoted Loveridge's record) we prefer to exclude the species from the avifauna of Kenya and Tanzania.]

CHARADRIUS DUBIUS CURONICUS (Gmelin) Little Ringed Plover

White records this bird south to the equator and central Tanzania and our records support this view.

The Little Ringed Plover is a scarce, somewhat unobtrusive wader in Kenya and Tanzania mainly to inland areas; it calls less often than the Ringed Plover *C. hiaticula* Linn. in our experience and thus some may escape notice. Jackson (1938) gave no Kenya records although van Someren (1922) had recorded it from Kisumu and south-west Lake Rudolf. Later, van Someren (1933) claimed that the bird was common on Lake Rudolf and that it also congregated in numbers on the sea coast from Lamu to Kismayu (Kismayu is now in Somalia). Moreau (1937) lends support to this view describing it as "widespread . . . . inland as well as on the coast". Mackworth-Praed & Grant (1957) indicate that it is mainly a freshwater bird but that it is "common on the Great Lakes and Lake Rudolf". Finally Williams (1969) gives it as an uncommon winter visitor to inland waters and with this view we would concur. We have never found the Little Ringed Plover to be common although it must be admitted that none of us knows Lake Rudolf well.

There are only two specimens in the National Museum although nineteen have been ringed in Kenya (at Naivasha and Nakuru). Available Kenya records fall between 3 October and 31 March. There are two dated records for Tanzania, five on Masanji Island, Lake Victoria, 9 February 1940 (Meiklejohn 1940) and of between three and five watched on salt pans near Dar es Salaam from 15 December 1970 to 25 January 1971 (W. G. Harvey *in litt.*).

PLUVIALIS DOMINICUS FULVUS (Gmelin) Eastern Golden Plover

White and Mackworth-Praed & Grant (1957) both mention its occurrence in Tanzania as a vagrant, and there is a male in the British Museum collected by Swynnerton on 20 October 1922 at Ndundu, Rufiji, Tanzania—no doubt the basis for these statments. No specimens exist for Kenya but there are sight records of one at the end of 1961 "immediately south of Mombasa" (Lee 1962) and one from late December 1969 to early January 1970 at Malindi (C.F.M.).

This species is known to be a great wanderer and has occurred in Somalia (Archer & Godman 1937) and South Africa (McLachlan & Liversidge 1957) as well as in many other places throughout the world far from its normal wintering area in the Pacific. It is quite likely therefore to occur from time to time on our coasts.

[*VANELLUS LEUCURUS* (Lichtenstein) White-tailed Plover

Vaurie and White record this southern Palaearctic species south to the northern Sudan; it is unrecorded from Ethiopia (Urban & Brown 1971).

We include the White-tailed Plover here in square brackets since Lee (1962) recorded having seen a possible example on the shore south of Mombasa on 27 December 1961. In his note he mentions having heard of another possible Kenya record at Lake Rudolf but we have no knowledge of this ourselves.]

GLAREOLA NORDMANNI Fischer Black-winged Pratincole

Vaurie makes the misleading statement that the Black-winged Pratincole winters from Somalia to Cape Province whereas White states that records are lacking from East Africa between Kenya, Katanga and the Zambezi. The majority of these birds migrate from eastern Europe and Asia to their wintering area in southern Africa via Zaire (Chapin 1939). South of Zaire in Zambia it is only known from the extreme west where it may be regular in large numbers in autumn (Benson *et al.* 1970) so that the bulk of the population crosses central Africa far to the west in Angola. This western route by-passes our area completely (cf. *Falco vespertinus* above) and Jackson (1938) had no records for Kenya or Uganda. Seth-Smith's specimens and sight records from Gondokoro, northern Uganda (in van Someren 1922) are from a place which is now in the Sudan. The only record from our area is of a bird picked up dead on the road near Lessos, western Kenya on 12 October 1969 (Mann 1971a).

HAEMATOPUS OSTRALEGUS OSTRALEGUS Linn. Oystercatcher

Both Vaurie and White include the coasts of Kenya and Tanzania within the winter range of this species.

The Oystercatcher may well be less common now than formerly and we certainly cannot agree that it is "common on the coast of Kenya" (van Someren 1932) since we know of hardly any modern records. Meinertzhagen (1922), although saying it was not common anywhere, had seen it at Mombasa between November and May and at Tanga (November) and Mafia Island (March) in Tanzania; also Loveridge (1922) often saw it at Dar es Salaam during 1918. Smart (1949) saw two at Kiunga on 12 August 1949, Fogden (1963) saw up to two near Kiunga between 4 August and 17 September 1961, and D. A. Turner (*in litt.*) saw one at Bamburi on 7 September 1962. The next record for the Kenya coast is of one seen flying south on 13 April 1971 *c.* 8km off Watamu (L. H. Brown *in litt.*). R. Lowis saw one on 19 July 1966 at Lake Rudolf and R. Gregory saw another at Eliye springs, Lake Rudolf in February 1970 (both records *per* D. A. Turner *in litt.*).

Zanzibar and Pemba are (or at least were) favourite localities for the Oystercatcher in East Africa as both Vaughan (1930) and Pakenham (1936, 1939) record parties of up to twenty birds, including several in July. The only other record for Tanzania (apart from those of Meinertzhagen and Loveridge mentioned above) is of one seen on 4 May 1969 at Dar es Salaam (J. F. Reynolds *in litt.*).

It is difficult to draw firm conclusions from the above data except that most sightings are on very early dates (July to September) and that the Zanzibar and Pemba flocks presumably arrived via Kenya. It is reasonable to assume that they follow (or followed) the Kenya coast some distance off-shore so that they are generally overlooked. The islands about Kiunga near the Somali border may well be a favourite feeding area but none was seen by P.L.B. and L. H. Brown on short visits in late August 1970 and late August—early September 1971 (the latter visit with G. S. Keith.).

LARUS ARGENTATUS Pontoppidan Herring Gull

Neither White nor Vaurie record the Herring Gull as far south as Kenya. The only records from our area are given by Elliott (1964). In his note Elliott gives the impression that he saw Herring Gulls at Mombasa, Tanga, Dar es Salaam and Zanzibar, however he has told us (*in litt.*) that this impression was not intended: he only saw *L. argentatus* in Dar es Salaam harbour mouth between December and February 1958/59 and/or 1959/60; unfortunately Sir Hugh's field notes covering this period were all destroyed by fire.

There are no records of the Herring Gull from Kenya and only one record from Uganda, two seen between 6 August and 29 November 1950 by Eggeling (Anon. 1950). As we have pointed out elsewhere in this paper, there is very little bird watching done on the East African coast and it is quite likely that the Herring Gull and other rarely recorded birds are more frequent than the sparse records would lead one to believe.

LARUS BRUNNICEPHALUS Jerdon Brown-headed Gull

This central Asian species, which winters south to Ceylon, is not recorded from East Africa by Vaurie, White or any other author of a standard work.

The sole record from our area is of two seen and photographed on 21 February 1969 in Ngorongoro Crater, Tanzania (van der Lee 1971). The six colour transparencies taken of the birds were examined by K. H. Voous who "concluded that these birds most definitely are specimens of *Larus brunnicephalus* Jerdon, Brown-headed Gull, a new species for this part of East-Africa."

LARUS GENEI Brème Slender-billed Gull

The sole record for our area is the sighting by Watson (1971) of a single bird on 28 March 1971 at Lake Manyara, northern Tanzania.

Vaurie and White record the species as south to Eritrea and Urban & Brown (1971) give one inland record for Ethiopia at Lake Basaaka, 8° 53′N.

LARUS RIDIBUNDUS Linn. Black-headed Gull

Since Vaurie, White and Mackworth-Praed & Grant (1957) do not include the Black-headed Gull from our area, the following sight records from Kenya extend the species' range considerably south of the Ethiopian lakes mentioned by White:

11-12 August 1967, 11 September 1967, 17 September 1967, adult in full plumage seen at Lake Nakuru (L. H. Brown, D. J. Pearson and D. A. Turner, all *in litt.*)

9-18 December 1950, 1 seen Malindi, (Smart 1952).

late December 1969—early January 1970, three seen together Malindi (C. F. M.)

March 1949, 1 seen Malindi (Smart 1952).

14 March 1970, 1 seen and photographed Lake Nakuru (Deane 1971b).

April 1956, adult in full plumage seen Ferguson's Gulf, Lake Rudolf (J. G. Williams *in litt.*)

The Black-headed Gull is thus an irregular winter visitor to the Rift Valley lakes and the coast and should be looked for in the future. It has yet to be recorded in Tanzania.

[*STERNA ALBIFRONS ALIFRONS* Pallas Little Tern

Vaurie gives the winter range as from "the Mediterranean south to Cape Province and from the Persian Gulf to western India", this could be taken to exclude the eastern seaboard of Africa. McLachlan & Liversidge (1957) only record it to Port Elizabeth (33° 58′S.) on the east coast. Mackworth-Praed & Grant (1957) state that it occurs throughout eastern Africa in the non-breeding season and also, in their southern Handbook (1962), that it occurs throughout southern Africa as well. Williams (1967) records the species from "coastal and inland waters" but does not say whether the nominate race is included in this statement.

We know of no records from our area and therefore concur with the implication of Vaurie's statement that it is absent from the eastern seaboard of Africa; this is also implied by White.]

STERNA HIRUNDO HIRUNDO Linn. Common Tern

Vaurie and White give the range of this species as the coasts of Africa south to the Cape of Good Hope White adds that it is a vagrant inland although Mackworth-Praed & Grant (1957) make no mention of this.

The Common Tern is a bird which is probably overlooked on the East African coast, and indeed could be confused with local species, including the Roseate Tern *S. dougallii* Montague. Pakenham (1936) records collecting two males from a flock of 200 terns on 23 July near Nungwi, Zanzibar and there is one labelled 'female' collected by him from the same locality on the same day in the British Museum. Jackson (1938) obtained the species and recorded it as "not uncommon" at Kanamai in September 1902. There are two modern sightings on the Kenya coast and one ringing recovery to Tanzania: two on 13 August and three on 22 August 1961 at Kiunga (Fogden 1963); three or four on 4 December 1960 at Kikambala (D. A. Turner, MS in EANHS file); a Common Tern ringed as a pullus in eastern Austria was found dead at Maziwi, Tanga on 21 April 1970 (Backhurst 1971b).

The sole inland record we can trace is of an immature trapped and ringed at Lake Nakuru on 26 September 1970 by G.C.B., P.L.B. and M.StJ. Sugg. Detailed photographs taken of this bird were shown to Miss Mary LeCroy of the American Museum of Natural History who kindly confirmed the identification. It is of interest that earlier on the same day a flock of *c.* 30 medium-sized terns with strongly forked tails was seen in the catching area. Unfortunately these could not be studied but it seems likely that they were Common Terns. The only other species which occur commonly at Lake Nakuru are the Gull-billed *S. nilotica* Gmelin and the White-winged Black Tern *S. leucoptera* Temminck.

The Common Tern may well be a regular visitor to the coasts of East Africa but the scarcity of observers there and the difficulty of field identification probably accounts for the small number of records. It can be no more than a rare vagrant inland.

STERNA NIGRA NIGRA Linn. Black Tern

The only documented record of a specimen of this species from our area is of a female obtained by Meinertzhagen on 30 April 1916 at Kisumu (Jackson 1938). Jackson (*op. cit.*), White, Vaurie and Mackworth-Praed & Grant (1957) all mention its occurrence in Tanzania, but while Jackson (*op. cit.*) cautiously writes "is stated to occur in Tanganyika" the other authors record it definitely from this country. We have no records at all of the Black Tern for Kenya and Tanzania although

vast flocks of the similar *S. leucoptera* Temminck occur, especially on inland waters. It should be remembered that few observers would attempt to 'pick out' a Black Tern when confronted with a wheeling flock of several hundred White-winged Black Terns. Over 200 'black' Terns have been ringed in Kenya and all have been *leucoptera*.

The admission of the Black Tern therefore rests solely on Meinertzhagen's Kisumu specimen yet it seems quite feasible that the species may be recorded in future since its breeding range overlaps that of *leucoptera*.

PHALAROPUS FULICARIUS (Linn.) Grey Phalarope

Neither Vaurie nor White record the Grey Phalarope from our area and its inclusion here rests on the following three published sight records, all from Kenya: two at Lake Nakuru on 15 February 1959 (Lee 1959); one at Lake Elmenteita on 17 February 1953 (Ridley 1953); and one at Lake Nakuru on 28 March 1959 (Lee 1959).

It is quite possible that examples of this oceanic species will be recorded in the fututre since it is often blown off course by gales.

PHALAROPUS LOBATUS (Linn.) Red-necked Phalarope

Vaurie, White and Mackworth-Praed & Grant (1957) have no records of the Red-necked Phalarope from our area.

The first East African record appears to be the bird seen and photographed in October 1959 at Lake Nakuru by E. S. Skinner. The photographs were submitted to J. G. Williams who wrote (*in litt.* to E. S. Skinner) "There can be no doubt that the bird photographed is indeed a Red-necked Phalarope and your photographs constitute the first confirmed record". Save for one at Diani Beach on 25 December 1966 (D. J. Pearson pers. comm.) all subsequent Kenya records are also from Lake Nakuru. One was seen on 10 January 1967 by D. J. Pearson (pers. comm.). Several were seen in early October 1970 of which two were eventually ringed and photographed on 11 October (G.C.B., C.F.M., A.D. Forbes-Watson); initially there were two on 3 October, increasing to three the next day, five on 10 October and six on 11 October. More recently, C. Smeenk (*in litt.*) saw three on 20 March 1971 and five the next day. In addition, another phalarope seen and photographed by G.C.B. at Lake Nakuru on 5 April 1970 is considered by most people who have seen the photographs to have been *lobatus*. Having seen and handled the October birds the observer is confident of the identification but I. J. Ferguson-Lees and two other unidentified British ornithologists considered that it was actually *fulicarius* (Ferguson-Lees *in litt.*).

The sole Tanzanian record is of one seen and photographed at Kazima Dam near Iringa on 10 October 1962 (Reynolds 1965).

As with the Grey Phalarope, the present species can be expected in East Africa from time to time.

CALIDRIS ALPINA ssp. (Linn.) Dunlin

A great deal of confusion surrounds the records of this species in East Africa. Reichenow (1894) writing on Tanzania, stated that it was a winter visitor to the coast but gave no precise details, nor does he record it from our area in his later work (Reichenow 1900-03). Vaurie implies that it is regular as far south as the equator and occasional to Zanzibar; White calls it casual to Kenya, Uganda and Zanzibar, while Mackworth-Praed & Grant (1957) state that it occurs inland and on the coast "usually in small flocks". The basis for these statements may well be the writings of Sperling, van Someren and Meinertzhagen: Sperling (1868) merely said that the Dunlin occurs at Zanzibar, van Someren (1918) wrote that "a few come here [Kenya] between November and January and remain till March". Later, (1922), he wrote "has been recorded from the coast and inland waters, but I have seen no specimens". Meinertzhagen (1950) recorded "one or two small parties of Dunlin" at Lake Magadi on 19—22 March 1949. However, J. G. Williams, who was with Meinertzhagen at Magadi tells us (*in litt.*) that he "disagreed with him [Meinertzhagen] at the time. But the error in identification is understandable when one considers that R. M. had just arrived from U. K. and was seeing birds in brighter light than in England, making everything appear large. The birds we saw were Little Stints *C. minuta* (Leisler)". Earlier, Sclater (1924) gave the range as "to Zanzibar" but Jackson (1938) said "there are no examples in the British Museum from so far south (as Zanzibar), nor are there any definite records in the literature except that of Captain Sperling". Guggisberg (1950) gave a record of one seen on 8 January 1950 at Nairobi Dam but presented no comment whatsoever, which is strange in view of the birds' rarity. Vaughan (1932) had no personal records from Zanzibar. In mainland Tanzania, J. S. S. Beesley (*in litt.*) saw a "possible" Dunlin on 10 January 1963 at Kisaki Dam, near Kondoa Irangi. However, as he does not feel certain of the identification, and as this is the only dated Tanzanian record, we cannot admit the Dunlin to the avifauna of Tanzania; Beesley fully agrees with this.

The only satisfactory Kenya record is of several seen, some in breeding plumage, on 28 March 1970 at Ferguson's Gulf, Lake Rudolf (C.F.M.). There are no specimens from East Africa either in the National Museum or the British Museum and Archer & Godman (1937) had only one Somalia specimen, from Berbera at more than 10°N, which is, incidentally, in the British Museum. Being such a rarity on the African coast even as far north as northern Somalia, it can be no more than a vagrant to the coast of East Africa; but in view of the above record from Lake Rudolf, and

the fact that it occurs throughout Ethiopia according to Urban & Brown (1971), it may be expected to be observed in the future in northern Kenya.

With the exception of a sight record near Cape Town mentioned by Mackworth-Praed & Grant (1963) and another which was photographed at Swakopmund in January 1965 (S.A.O.S. List Committee 1969), the Dunlin is not recorded in Africa south of Lake Rudolf in the east and The Gambia in the west (White), but R. Stjernstedt has told us (*in litt.*) of one he saw at Mpulungu, Zambia (8° 46′S.) on 30 September 1970. A sighting of between 15 and 29 Dunlin at a dam near Johannesburg from 4 January to 29 March 1970 is therefore quite remarkable and worthy of discussion. The authors (Schmitt & Hunter 1971) make no comment except that Schmitt was "not at first aware that the Dunlin did not normally come as far south as the Transvaal". The editor makes no comment either, perhaps because the Dunlin is admitted to the avifauna of South Africa, although Dowsett & Irwin (1970) question the validity of this. The fact that Mackworth-Praed & Grant (1957) record it south to Mozambique also gives the impression that it might well occur a little further south in eastern South Africa. We have ignored this reference to Mozambique especially as the authors themselves make no mention of it in their later work (1963). It is not our place to either accept or reject this record as it is from well south of our area; but it is useful to point out how exceptional the record is, being inland, so far south, and involving a large number of individuals.

CALIDRIS CANUTUS CANUTUS (Linn.) Knot

The Knot is another species whose status in East Africa remains vague save for two recent sight records (see below).

Van Someren (1918) writing on Kenya mentions that "one specimen has been shot by A. Blayney Percival in December"; later in 1922, he wrote "recorded from Zanzibar. I have not collected specimens". Jackson (1938) refers to van Someren's mention of this species but adds "it seems very doubtful if it occurs on the eastern side of Africa at all". However, Vaurie gives the range as south to about Zanzibar and White is vague: "Possibly only a vagrant to East Africa (Uganda, Kenya, Zanzibar)". Mackworth-Praed & Grant (1957) appreciate that the Knot is rare in Africa but also mention that it has visited Uganda and Zanzibar but they do not give details. We have been unable to trace any specimens of this species. One seen on 16—17 September 1961 at Kiunga with Curlew Sandpipers *C. ferruginea* (Pontoppidan) by Fogden (1963) and three seen on 17 November 1970 on salt pans at Dar es Salaam by Harvey (1971) are the only dated occurrences which we can find.

The Knot can be no more than a very rare vagrant to the East African coast since it is not recorded from Arabia or northern Somalia (Meinertzhagen 1954, Archer & Godman 1937). A British ringing recovery communicated by R. E. Scott (*in litt.*) provides evidence that Knot reach the east coast of Africa at least occasionally, possibly via the Cape. The bird concerned was ringed in Kent, England on 30 August 1969 and was recovered at Lourenco Marques, Mozambique on 10 October 1970 (not in the same wintering 'season'). Although regular on the west coast of South Africa (McLachlan & Liversidge 1957) it is rare east of the Cape of Good Hope, and, as far as we are aware, the Lourenco Marques bird is the first record for Mozambique. Clancey (1965) provides the first record for Natal, this being the most northerly record previously available for the Indian Ocean coast of southern Africa. Thus the two sight records in this paper provide the only evidence of its occurrence in eastern Africa between the Mediterranean and southern Mozambique. A specimen from either Kenya or Tanzania would be most desirable.

CALIDRIS MELANOTOS (Vieillot) Pectoral Sandpiper

The Pectoral Sandpiper, although mainly a Nearctic species, does breed in the eastern Palaearctic (Vaurie) and is therefore included in this review. The sole record for East Africa is the adult male obtained at Lake Naivasha on 11 May 1952 (Williams 1952). Williams noted that the bird was extremely fat and considered this especially remarkable; it seems less remarkable to us: the first half of May is a time of considerable wader passage at Naivasha and many species reach their highest fat levels during this period (G.C.B. personal observation).

The Pectoral Sandpiper is the most numerous of the rare waders to occur in Britain and most of those seen are in autumn (Sharrock 1971). In the ten years 1958-1967 Sharrock found only one record for the four months December-March whereas he gave 45 records for September. This pattern of occurrence, which resembles that of a normal (British) autumn passage migrant (e.g. Wood Sandpiper *Tringa glareola* Linn.), indicates that the majority of the birds must pass on south, some of them no doubt to Africa. Sharrock (*op. cit.*) speculates that some of the Pectoral Sandpipers seen in Britain may have come across Asia and Europe from the eastern Palaearctic since this species is more common on the east coast of Britain than are other Nearctic waders. The Ruff *Philomachus pugnax* (Linn.) and Curlew Sandpiper both visit Britain and East Africa from areas to the east of the most westerly Pectoral Sandpiper breeding area so that it is conceivable that some individuals of this species might accompany parties of Ruff and/or Curlew Sandpipers. Recently Ginn & Brooke (1971) have reviewed the occurrence of the species in Africa and add a spring specimen from Botswana on 25 April 1971.

CALIDRIS SUBMINUTA (Middendorff) Long-toed Stint

There are two records of this species, both from Kenya. The first was one obtained at Naivasha on 27 April 1969 (Backhurst & Britton 1969) and the second was ringed at Lake Nakuru on 9 May 1970 (G.C.B.). Both were in breeding plumage and heavy, weighing 27.7 and 32.5g respectively, which compares favourably with the weights of the somewhat larger Little Stints *C. minuta* (Leisler) caught at the same time.

The Long-toed Stint winters much nearer to East Africa (in Ceylon) than does the Pectoral Sandpiper. The two individuals recorded from Kenya were clearly migrating north, in good condition, with allied species which breed in similar areas of the Palaearctic (Vaurie). The Red-necked Stint *C. ruficollis* (Pallas) can be expected in the future as there are two specimens from Natal, South Africa (Clancey 1964).

No Long-toed Stints were caught in the spring of 1971 although large numbers of Little Stints were handled in this period. However, from the two records already mentioned, plus one from Ethiopia (Broberg 1967) and one from South Africa (Spronk 1969, but see Dowsett & Irwin 1970), it seems likely that this species will be recorded from time to time in the future. Although very similar to the Nearctic *C. minutilla* (Vieillot) which has been recorded in South Africa (Tree 1968, but see Clancey 1969), it is distinctive in breeding plumage. Nevertheless, we would be reluctant to identify it in the field, although handled but not collected birds are quite acceptable provided that adequate notes and/or photographs are taken.

CALIDRIS TEMMINCKII (Leisler) Temminck's Stint

Vaurie and White record this species south to Kivu, Zaire (i.e. *c.* 2°S.) but with no indication as to its abundance. Jackson (1938) gives no Kenya records but Mackworth-Praed & Grant (1957) give a good account of its occurrence ". . . . especially to inland waters. Not so common in Africa as the Little Stint and is usually in pairs or small parties, not in flocks." We would agree with this view except that, in our experience, it is usually seen singly.

The first Kenya record was of one obtained in September 1936 at Lake Naivasha (Stoneham 1944). Thereafter we have many sight records (including birds ringed) from several localities in Kenya from Ferguson's Gulf in the north (J. Gerhart *in litt.*) to Amboseli in the south (D. A. Turner *in litt.*). The earliest record we have is of two seen on 31 August 1958 at Ol Joro Orok (Bednall 1959) and the latest is of three seen on 6 May 1971 at Naivasha (G.C.B.). The largest number recorded together is three: on 7 February and 6 May at Naivasha (G.C.B.).

There are only two records from Tanzania: one on 15 November 1938 at Bukoba (H.F.I. Elliott *in litt.*), and one there on 26 January 1940 (Meikljohn 1940). Moreau (1937) did not mention this species and J. S. S. Beesley (*in litt.*) has never seen it in Tanzania.

Temminck's Stint is a regular but sparse visitor to Kenya. In our experience it favours small inland marshy areas where it usually feeds quietly and escapes notice until one is almost on top of it, when it flies away, often giving its characteristic trilling call.

GALLINAGO MEDIA (Latham) Great Snipe

Some mystery surrounds the present status of this bird in Kenya and Tanzania. There is no doubt that it migrates to the south of our area (e.g. Benson *et al.* 1971, McLachlan & Liversidge 1957) but we feel that it cannot be as common now as earlier writers (e.g. van Someren 1922, Granvik 1923, Jackson 1938) indicated. In view of this impression we have gained it is interesting that McLachlan & Liversidge (*op. cit.*) writing on South Africa state that the "Present status indicates that the bird is not as common as it used to be".

There are a number of skins in the British Museum from both countries including Zanzibar, and Pakenham (1945) records it from Pemba. The earlier writers found that the Great Snipe was a very late migrant in spring: van Someren (*op. cit.*) stated that they leave the Kisumu area on 28 May but in 1917 he recorded them as late as 15 June. In three years residence near Kisumu, P.L.B. has only one record, on 21 November 1969, but C.F.M. finds that it passes through Kapsabet between mid October and mid November and then again during the second and third weeks of May; the largest number recorded seen together is ten.

In eight years residence near Nairobi, G.C.B. has never recorded it at all, yet he has ringed many *G. gallinago* (Linn.) and *G. nigripennis* Bonaparte, mainly at Naivasha. These observations indicate that it may well be more numerous as a passage migrant in the west of our area, except that Jackson (*op. cit.*) said that it is "undoubtedly more common in Kenya than in Uganda". It was certainly common in the past in localities well-worked by G.C.B. (Jackson specifically mentions both Nairobi and the Rift Valley) who makes a special effort to catch migrating waders in May. Snipe-shooters at places such as Ol Bolossat should look out for this species in May so that we may know more clearly its present status in our area.

(We should like to note here that the Great Snipe has been included as an afterthought; the account above does not include records from local ornithologists since we did not ask for records of this species.)

GALLINAGO MINIMA (Brünnich) Jack Snipe

Vaurie and White both record this species as extending south to Tanzania with one female from Zambia (Mwinilunga in the north-west at 11° 44′S., White 1948) which is in the British Museum. There are no skins in the British Museum from Kenya or Tanzania and only one (25 December 1931, Tulazu (=Tulasha) River, Kinangop) from Kenya in the National Museum. Meinertzhagen (1922) shot two in Nairobi on 15 November 1915 and saw one earlier in the month at Naivasha. Van Someren (1922) and Jackson (1938) record it from the Sio River (border of Kenya and Uganda), Nyeri, Nairobi, Naivasha and Nakuru. D. A. Turner (*in litt.*) saw one on 26 January 1970 at Naivasha and J. G. Williams (*in litt.*) writes that it is "most frequent at Semini's Dam, South Kinangop". We have no personal records, although C.F.M. saw one near Tororo, Uganda on 9 October 1967, i.e. near the Kenya border.

We can find only two records for Tanzania: one was shot on 19 February on the Mbalagetti River (Moreau 1935) and another was collected by N. Williams on 29 December 1957 at Tabora (MS in EANHS file). Cave & Macdonald (1955) record it as fairly common in the Sudan, and Urban & Brown (1971) call it uncommon to rare in Ethiopia. More records of this species can be expected, especially in northern marshy areas of Kenya.

GALLINAGO STENURA (Bonaparte) Pintail Snipe

There is only one record for Kenya, a bird photographed and ringed on 1 January 1969 at Naivasha (Backhurst 1969), and only one other for the African mainland (Juba River, Somalia, van Someren 1929). There is a male from Socotra Island in the British Museum collected by Ogilvie-Grant and Forbes on 18 January 1899. It is therefore of interest that G. R. Cunningham-van Someren (*in litt.*) writes as follows: "Alas my game-book was damaged by fire but there have been a few other records of the snipe [*G. stenura*] in Kenya however almost certainly never published. I have a feeling that there may be a specimen of the Pintail [Snipe] in the [National] Museum shot by Dr. McInnes around just pre-1939—may be you have checked this [there is no such specimen in the National Museum now—*authors*]. The Pintail [Snipe] was also shot in Ethiopia, the swamps of Adda, 1940 by military parties". In view of these remarks the species should be expected in the future. However, it should be remembered that it is not recorded for the Sudan, Ethiopia, ex-British Somaliland or Arabia (Cave & Macdonald 1955, Urban & Brown 1971, Archer & Godman 1937, Meinertzhagen 1954).

LIMICOLA FALCINELLUS FALCINELLUS (Pontoppidan) Broad-billed Sandpiper

The Broad-billed Sandpiper is not recorded from our area or Uganda by Vaurie or White. There is a 1964 specimen from western Uganda in the National Museum and also a more recent one from the same area (M. P. L. Fogden *in litt.*). There are no Kenya records but one was seen at Kazima Dam near Tabora, Tanzania by Reynolds (1965) on 5 November 1961. It is likely that this species will be recorded from Kenya in the future. As Nisbet (1961) points out, the main wintering area of the Broad-billed Sandpiper is unknown but may lie somewhere in eastern Africa. It may be noted in passing that a *L. falcinellus* is recorded from Swakopmund, South West Africa (S.A.O.S. List Committee 1969).

LIMNODROMAS SEMIPALMATUS (Blyth) Asiatic Dowitcher

White does not include this species and Vaurie gives no records for the Ethiopian Region. The sole record of which we are aware is the bird seen at Lake Nakuru, Kenya by Smart & Forbes-Watson (1971) on 20-21 November 1966.

LIMOSA LAPPONICA LAPPONICA (Linn.) Bar-tailed Godwit

Vaurie and White suggest that this species occurs in our area, and both White and Mackworth-Praed & Grant (1957) mention the bird at the coast. Jackson (1938) gave no records at all but van Someren (1932) had recorded it from Kismayu, Somalia, 200 km from the Kenya border.

The first Kenya record is claimed by V. D. van Someren (1958) in November (no year) at Kikambala. We are aware of only the following subsequent records:

23 July 1956, 1 seen Namuraputh, north end of Lake Rudolf, J. R. M. Tennent (MS in EANHS file)
27 August 1970, 1 seen Kiunga, P. L. B. and L. H. Brown
15 September 1961, 1 seen Kiunga, Fogden (1963)
16-18 September 1961, 3 seen Kiunga, Fogden (1963)
5-6 October 1968, 1 seen Mida, G.C.B.
November 1969, 1 photographed Lake Nakuru, A. J. Deane (*in litt.*)
10-11 December 1970, 2 seen Mida, Goddard (1971)
17 December 1949, ♀ Mida, National Museum

There are two records from Tanzania, both at Dar es Salaam: five on 18 October 1945 (Morrison 1946) and an immature male obtained in September 1955, now in the National Museum.

The Bar-tailed Godwit is probably regular in small numbers on the coast, indeed, according to Williams (1967) a few usually winter in Mida Creek. It is significant that we can trace only two inland records (compare the next species) and that there is no record after December.

LIMOSA LIMOSA LIMOSA (Linn.) Black-tailed Godwit

Vaurie records this species as south to northern Tanzania and White mentions that it occurs more often on fresh waters than on the coast and that it is a vagrant south to Cape Province. Jackson (1938) had no records.

From the data at our disposal the Black-tailed Godwit appears to be a regular visitor in very small numbers, almost always to inland localities; the only coastal records are of one at Kiunga on 16-17 September 1961 (Fogden 1963) and one to four near Dar es Salaam between October and December 1970 (W. G. Harvey *in litt.*). Inland in Kenya we have records from Aruba and Kandeni (Tsavo East National Park), Lakes Elmenteita, Naivasha and Nakuru, Athi River, Mwea and Suguta Naibor. At the last mentioned locality, 15-20 were seen on 14 September 1958 (Bednall 1959a) which constitutes both the earliest date and the largest party. The latest passage bird was seen on 3 April 1959 at Lake Elmenteita (J. G. Williams in Bednall 1959b) but P.L.B. saw a summering bird in non-breeding dress at Lake Nakuru on 27 June 1969.

From Tanzania there are three records in addition to the Dar es Salaam birds mentioned above: 7 October 1962, Kazima Dam, near Tabora (Reynolds 1965); 6 January 1965, Wembere, near Tabora (Reynolds *op. cit.*); 2 March 1946, Lake Manyara (Fuggles-Couchman & Elliott 1946).

[*SCOLOPAX RUSTICOLA* Linn. Woodcock

This species is included as it is mentioned by Lynn-Allen (1951). Major Allan North assured Lynn-Allen "most positively" that he encountered one on Marsabit Mountain during the Second World War, probably in October. To Lynn-Allen "it is barely conceivable that an experienced shot could be mistaken over such a well-known species". He then adds that "the Marsabit forests, thick, cool and well-watered, are just such places where one would expect to find woodcock—possibly a strayed juvenile on its southerly migration". We agree with Lynn-Allen that the Woodcock is unmistakable, especially to an experienced shot, so that despite the lack of records from Ethiopia (Urban & Brown 1971) we think it *possible* that the Woodcock might occur in northern Kenya eventually. According to Vaurie the Woodcock is sedentary and migratory but although he gives its winter range as south in Asia to Ceylon and Malaya, he does not record it from the Ethiopian Region at all.]

TRINGA ERYTHROPUS (Pallas) Spotted Redshank

The Spotted Redshank is not recorded from Kenya, Tanzania or Uganda by Vaurie, White, Jackson (1938) or Mackworth-Praed & Grant (1957); it is not recorded from former British Somaliland (Archer & Godman 1937), while in the Sudan Cave & Macdonald (1955) do not record it further south than 9°N. Urban & Brown (1971) include it for Ethiopia as "uncommon to frequent" but give no precise localities.

It seems certain that the abundance of the Spotted Redshank on passage and in winter has changed considerably over the last thirty years. In the British Isles, Witherby *et al.* (1943) described it as an uncommon passage migrant in autumn, scarce in spring and exceptional in winter, whereas today it is by no means uncommon even in spring (personal observations). In Kenya, the bird (a male) was first obtained on 8 February 1953 at Semini's Dam, South Kinangop (Williams 1953) while a second male was taken on 15 March 1958 at Ferguson's Gulf, Lake Rudolf; both specimens are in the National Museum. We now have details of thirty sightings of this species in Kenya: the earliest date is 6 September 1959 at Lake Naivasha (Lee, MS in EANHS file). There are no other September records, none for October, and only one in late November (Deane 1971a). There are records for December to May with most falling in February and March. The latest is a bird in breeding plumage at Ahero, Western Kenya on 8 May 1971 (Simpson 1971). The maximum number recorded together is ten (Deane *op. cit.*) while there are also two records of *c.* 10. Most are from Lake Naivasha, Lake Nakuru and Tsavo East National Park. One has been ringed at Naivasha in January 1970 (G.C.B.).

The Spotted Redshank is less frequent in Tanzania where Moreau (1937) did not note it at all, but Meiklejohn (1940) had two sight records near Bukoba in December 1939 and January 1940. J. S. S. Beesley (*in litt.*) considers it a regular visitor between December and February to Arusha Chini; M. Probyn has three sight records from the Arusha area (MS in EANHS file); and W. Leuthold (*in litt.*) saw two on the late date of 22 May 1970 in Ngorongoro Crater. It is listed for Ngorongoro by Pickerling (1966) and also for Lake Manyara (Anon., no date, The Lake Manyara National Park, Checklist of Birds, Tanganyika National Parks).

We would describe the Spotted Redshank as a regular winter visitor, more common in February and March, to freshwaters in Kenya and northern Tanzania.

TRINGA TOTANUS (Linn.) Redshank

White records both nominate *totanus* and *eurhinus* (Oberholser) from our area while Vaurie believes that examples from East Africa are nominate birds or intermediates. As we have relied heavily on sight records we have treated this species binomially.

Mackworth-Praed & Grant (1957) have given a quite false impression of its status in our area describing it as "a very common palearctic winter visitor to the Red Sea coast and East Africa, occurring as far south as Beira and Durban". Jackson (1938) gave no definitive records although

he thought that he heard one near Lamu. Williams (1955) said that "unless the evidence of collected specimens proves to the contrary the status of *T. t. eurhinus* in eastern Africa should be amended to rare palearctic visitor". We have located only a few Kenya records:

22 July 1961, 1 seen Kiungamini, Fogden (1963)
10 August 1968, 1 seen Lake Nakuru, G.C.B.
15 August 1949, 3 seen Shekani, Smart (1949)
23 August 1961, 1 seen Kiunga, Fogden (1963)
15 September 1968, 1 seen Lake Naivasha, G.C.B.
18 September 1968, 1 seen Lake Nakuru, G.C.B.
5 October 1968, 1 seen Mida, G.C.B.
28-29 October, 1 seen Narok, F. N. Betts in MS
27 November 1955, ♂ Lake Magadi, National Museum
11 December 1970, 19 seen Mida, Goddard (1971)
end 1961, seen "immediately south of Mombasa", Lee (1962)
30 January 1971, 1 seen Lake Kanyaboli, P.L.B. & C.F.M.
25 February 1971, a different bird seen Lake Kanyaboli, P.L.B.

We have the following records from Tanzania:

10 October 1959, 1 seen Kazima Dam near Tabora, Reynolds (1965)
7 November 1964, 1 seen Wembere near Tabora, Reynolds (1965)
13 December 1970, 2 seen Dar es Salaam (salt pans), W. G. Harvey (*in litt.*)
31 December 1939, Chabula Swamp, S. E. Lake Victoria, H. F. I. Elliott (*in litt.*)

The Redshank is clearly a rare but regular visitor to our area, both inland and on the coast, especially from August to December.

STERCORARIUS LONGICAUDUS Vieillot Long-tailed Skua

Neither Vaurie nor White record this species from the Ethiopian Region.

One seen and photographed in flight by A. D. Forbes-Watson on 25-26 August 1961 at Ferguson's Gulf, Lake Rudolf constitutes the first Kenya record. The photographs, which leave no doubt as to the bird's identity, are lodged in the National Museum. There is only one other African record, of a bird obtained on 28 August 1969 at Kolokopé, Togo (De Roo & van Damme 1970).

STERCORARIUS PARASITICUS (Linn.) Arctic Skua

The Arctic Skua is recorded by Vaurie and White from no nearer East Africa than Zululand. The only record we have is the sighting of a light phase bird on 9 April 1966 at Casuarina Point, Malindi (Backhurst 1971a). This species may occur more frequently than this single record would suggest. However, at present there is very little bird-watching done off our coasts.

CUCULUS POLIOCEPHALUS POLIOCEPHALUS Latham Lesser Cuckoo

Vaurie and White record the nominate eastern Palaearctic subspecies for coastal eastern Africa from Kenya to Natal, west to Katanga, eastern Zambia and Rhodesia (White). The Malagasy form *rochii* Hartlaub, which also visits our area is indistinguishable in the field, and many specimens cannot be certainly assigned racially. According to Mackworth-Praed & Grant (1957) *rochii* occurs mostly from April to August, so that the dates of the two forms hardly overlap; Chapin (1939) states that the African records fall between June and September. Grant & Mackworth-Praed (1936-37) mention nestlings and young specimens from east—central Madagascar in March and April, and conclude "breeding Madagascar October to April, visits Africa May to September". Thus most dated birds may be assigned racially with reasonable certainty. Unfortunately, the period of possible overlap in April is a critical time when Palaearctic *Cuculus canorus* Linn. pass through the east of our area in some numbers (authors in prep.).

Jackson (1938) recorded only *rochii* in Kenya and Uganda, both Kenya birds from the coast (Rabai and Lamu). The Rabai specimen was collected on 21 April by van Someren (1932) who does not in fact assign it to *rochii* with any certainty, although he suggests that it is probably *rochii* (the only form given for the Ethiopian Region by Sclater (1924)). The Lamu bird was first reported by Sclater (*op. cit.*), but he gives no date. He implies that the specimen is in the British Museum so that it is odd that Grant & Mackworth-Praed (*op. cit.*), who presumably used this material, restricted *rochii* to Madagascar until they were informed by Chapin of Zaire and Uganda specimens. The Lamu bird is best left as racially indeterminate, in which case we know of no Kenya record of *rochii*. Moreau (1966) and White record it for Kenya but this may simply refer to the Lamu bird. Since *rochii* reaches Uganda and eastern Zaire it presumably passes through parts of Tanzania regularly. Nevertheless the only Tanzania record of which we are aware is from the north-east, a male collected near Amani on 26 November (Sclater & Moreau 1932, 1933). In western Kenya, near Eldoret, C.F.M. saw a Lesser Cuckoo on 4 May 1971 which may well have been *rochii* (on date), and it is reasonable to assume that *rochii* reaches Kenya in the extreme west.

In north-eastern Tanzania, Moreau & Moreau (1937) saw large numbers of Palaearctic *poliocephalus* associated with *C. canorus* in a "great migration" at the end of March 1934. They noted a similar movement between 31 March and 12 April the next year, so that there is probably

a regular passage through north-eastern Tanzania at this time. Specimens of both species were very fat. The few other Tanzania records are 30 November, 4 December, 13 January and 21 January (Moreau 1944, Meiklejohn 1940, Friedmann & Stager 1964).

The only definite nominate birds from Kenya are two males from the coast at Sokoke Forest: 28 March 1951 in the National Museum and 18 April 1970 in the British Museum (another bird collected for the British Museum at Sokoke on 11 April 1970 is preserved in spirit and is not raced). This locality is close to Watamu where Brown (1971b) saw a total of perhaps fifty Lesser Cuckoos crossing Mida Creek to the south in a purposeful manner in April 1971 (mainly 9-12 April with a few to 19 April at least). In view of the direction in which they were moving he concluded that they were most likely *rochii*. This is not a reasonable supposition as neither form should be moving in this direction in April. Madagascar is well south of Kenya and any *rochii* in Kenya at this time would be moving north-west just as any *poliocephalus* would be moving north-east. At the time of Brown's observations P.L.B. and C.F.M. saw several birds of this species in Sokoke Forest along with large numbers of Palaearctic *canorus*.

In view of the impossibility of racing birds except on measurements, and then only males we still have a great deal to learn about the status of both forms in our area. There is a regular passage of the Palaearctic form through north-eastern Tanzania in spring which extends to some extent to coastal Kenya. It coincides with the movement of large numbers of Palaearctic *Cuculus canorus*. The absence of any records in Africa north of Kenya suggests that this species makes a direct flight across the Indian Ocean from our area to Asia, probably India (the breeding area is north and north-east of the Himalayas in India and China). Its migration is thus somewhat similar to that of *Falco amurensis* (see above) except that the crossing is probably a little shorter. From the comparative lack of birds in autumn one might think that a more southerly route is used at that season, but it should be noted that funnelling in diurnal migrants is only apparent before a sea crossing, not after, and the more scattered individuals in autumn could well go unnoticed.

ASIO FLAMMEUS FLAMMEUS (Pontoppidan) Short-eared Owl

The European Short-eared Owl is not recorded from our area by Vaurie, White, Jackson (1938) or Mackworth-Praed & Grant (1957).

The first record, from Kenya, is the female collected on 27 January 1927 at Makuiwa, Mt. Elgon (Granvik 1934). Brown (1971a) saw a Short-eared Owl flying in over the sea at Mida Creek on 5 January 1971 and earlier, Moreau (1938) had observed two Short-eared Owls come aboard a ship travelling south from the Red Sea; one of these birds left on 12 November 1936 at 2°S., i.e. off the Kenya coast north of Lamu. The species is not recorded from Tanzania.

OTUS SCOPS SCOPS (Linn.) European Scops Owl

Vaurie, White and Mackworth-Praed & Grant (1957) record the nominate race of the Scops Owl as a non-breeding migrant as far south as Kenya, but these authors do not define its abundance. Williams (1969) mentions that it is a winter visitor to East Africa.

Van Someren (1932) collected specimens at Kiambu and Nairobi in January, February and March, and Jackson (1938) mentions two Kenya specimens, both of which are in the British Museum. The following is a list of all dated records (including those cited by Jackson (*op. cit.*), marked with an asterisk):

22 November 1920, ♀ Kiambu, British Museum
6 December 1960, ♀ Nairobi, National Museum
7 February 1900, ♂ Msara, British Museum*
5 March 1971, 1 ringed Athi River, D. J. Pearson (*in litt.*)
15 March 1944, ♂ Muthaiga, Nairobi, National Museum
16 March 1897, ♂ Eldama Ravine, British Museum*

We have been able to trace no records from Tanzania. The status of the European Scops Owl in our area must remain a mystery; it may be an uncommon but regular visitor. The subspecies cannot be determined in the field and it is unlikely that the European bird would betray its presence in Africa by calling.

OTUS SCOPS TURANICUS (Loudon)

This pale race of the Scops Owl has been collected once in our area, at Bura on the Tana River on 5 March 1963 (Friedmann & Keith 1968). As with the nominate race, it is impossible to draw any conclusions on the true status of the species in East Africa since Scops Owls are so rarely seen or caught.

JYNX TORQUILLA Linn. Wryneck

The Wryneck is not recorded by Vaurie, White, Jackson (1938) or Mackworth-Praed & Grant (1957) from our area although all these authors record the species from Uganda.

There is no Tanzanian record and only one from Kenya, the bird first seen on 19 February 1969 and ringed on 22 February at Ng'iya, western Kenya (Britton and Harper 1969). Two races (*torquilla* and *tschusii* Kleinschmidt) are recorded from Uganda but no subspecific differentiation was attempted for the Kenya bird. It is likely that the Wryneck occurs from time to time in northern Kenya. Urban & Brown (1971) record it from Ethiopia and D. J. Pearson informs us (*in litt.*) that one has been ringed recently in eastern Uganda.

EMBERIZA HORTULANA Linn. Ortolan Bunting

White, Jackson (1938) and Mackworth-Praed & Grant (1960) all record this species from northern Kenya and, as far as we can ascertain, the only record is the bird mentioned by Jackson (*op. cit.*) and now in the British Museum; a young unsexed bird collected by Kemp on 15 October 1910 at Baringo. The Ortolan should be found in northern Kenya since it is "locally frequent to common" in Ethiopia (Urban & Brown 1971).

LANIUS NUBICUS Lichtenstein Masked or Nubian Shrike

The only record from our area is the immature bird collected on 9 November 1969 at Lake Kanyaboli, western Kenya (Britton 1970b). As Britton (*op. cit.*) pointed out, Mackworth-Praed & Grant (1960), White and Archer & Godman (1961) all mention its occurrence near Lake Rudolf without specifying the country. In the British Museum collection a box of *L. nubicus* has "Lake Rudolf" written on the label but a thorough search through all the skins of this species in the collection failed to unearth the Lake Rudolf bird (G.C.B., July 1971). With only three records from south of 10°N. (Britton *op. cit.*) the Masked Shrike can be no more than a vagrant to our area.

LANIUS SENATOR NILOTICUS (Bonaparte) Woodchat Shrike

Jackson (1938) had no records of this species from Kenya but Vaurie, White and Mackworth-Praed & Grant (1960) all record it from western Kenya. There are no specimens from our area in the National or British Museums. Meinertzhagen (1921) collected a pair on 10 January in the Maragoli Hills, western Kenya and the other records of the species are those of P.L.B. at Lake Kanyaboli, also in western Kenya, virtually on the equator:

adults seen on 8 November 1969, 9 November 1969 (ringed), 22 November 1969, 29 November 1969 (two seen), 31 January 1970, and 20 March 1970; an immature was seen on 11 November 1969. Britton (1970b) mentioned an exceptional influx of Palaearctic migrants at Lake Kanyaboli in November 1969 of which most of these Woodchat Shrikes, and the previous species, were a part.

ANTHUS CAMPESTRIS (Linn.) Tawny Pipit

Vaurie and White give the winter range as south to the equator; Vaurie recognises two races (White does not) but none of our records can be assigned subspecifically.

Van Someren (1922) had two males from Tsavo (Kenya) on 26 March 1918 and these were the only specimens known to Jackson (1938). There are no examples in the National or British Museums from our area. We have four sight records, all from Kenya:

22 July 1956, seen Lokitaung, north end of Lake Rudolf, Tennent (MS in EANHS file)
11 October 1959, seen Sukari, near Nairobi, Lee (MS in EANHS file)
20 October 1968, 1 seen Lake Nakuru, P. L. B. and J. F. Harper
26 March 1967, 1 seen Lake Kisima, near Maralal, G.C.B.

The Tawny Pipit may well be more regular in northern Kenya than these few records suggest.

FICEDULA ALBICOLLIS (Temminck) Collared Flycatcher

Two races of the Collared Flycatcher are recognised, namely nominate *albicollis* and *semitorquata* Hofmeyer; Vaurie and White record both from Tanzania but neither author mentions Kenya. Mackworth-Praed & Grant (1960) recognise no races of the Collared Flycatcher but treat *semitorquata* as a race of *F. hypoleuca* (Pallas), the Pied Flycatcher.

Urban & Brown (1971) do not record this species from Ethiopia, and Williams (1967, 1969) does not record it from Kenya or Tanzania; Mackworth-Praed & Grant (*op. cit.*) record *semitorquata* from Tanzania and say that *albicollis* should occur in that country. Lynes (1934) found *semitorquata* a fairly common winter visitor to Iringa, and two of his birds are in the British Museum: a male, 10 January 1932 from near Njombe and another male, 22 January 1932 from Iringa; in the National Museum there is an unsexed bird from Kibondo (Tanzania) collected on 24 February 1961. Reynolds (1969) records it from Tabora on 11 February 1965 and he has further records (*in litt.*) of *semitorquata* from Iringa on 9 February (male) and 17 February (female) 1968.

This species is a sparse migrant to Zambia (Benson *et al.* 1971), Malawi (Benson 1953), Rhodesia (Smithers *et al.* 1957) and Zaire (Chapin 1953); so that, as Chapin (*op. cit.*) suggests, the population which winters in southern Tanzania and further south passes to the west of Kenya through Uganda and Zaire. As it is far commoner in the east than in the west of Zambia with virtually no records west of 31°E. (Britton 1970a), and as the most easterly recorded locality in Tanzania is Iringa at about 36°E., its wintering area is thus very limited.

The Collared Flycatcher is still not recorded from Kenya where it may well occur eventually in the extreme west. In Tanzania it is probably regular and locally numerous in the west and south-west.

FICEDULA HYPOLEUCA HYPOLEUCA (Pallas) Pied Flycatcher

Vaurie and White say that the Pied Flycatcher winters in savannas north of the equator, while Jackson (1938) and Mackworth-Praed & Grant (1960) do not include it.

Two specimens from Kakamega Forest in extreme western Kenya represent the only definite records from our area: one collected by A. D. Forbes-Watson for the Smithsonian Institution is to be reported on eventually by Ripley and Bond (see Appendix), the other (unsexed) was collected by J. F. Harper on 24 December 1970 and is in the National Museum. In addition, Granvik (1934) collected a female *hypoleuca* on the north-eastern slopes of Mt. Elgon on 5 November 1926; this locality may be just inside Uganda. In view of Moreau's (1966) opinion that *Ficedula* flycatchers will eventually be found wintering in the canopy of (west) African forest, this species may well be more common in Kakamega Forest than these two records suggest. It is worth noting that P.L.B. and C.F.M. glimpsed a bird which could only have been a *Ficedula* in this forest on 31 January 1971. There are recent records from west of our area in Uganda (M.P.L. Fogden; R. Frankum; E. R. Waterhouse; all *in litt.*).

ACROCEPHALUS ARUNDINACEUS GRISELDIS (Hartlaub) Basra Reed Warbler

Two large races of *A. arundinaceus, arundinaceus* Linn. and *zarudnyi* Hartert are not uncommon in parts of our area and are omitted from this review. The present race, *griseldis*, is much smaller than the others, which are called Great Reed Warbler in English.

Vaurie and White give the Ethiopian distribution of *griseldis* as Eritrea to Kenya, once to Malawi; Mackworth-Praed & Grant (1960) (who, incidentally, treat the bird as a distinct species) add eastern Tanzania to the range. Williamson (1968), who had access to only ten specimens, gives the winter range as "E. Africa". The sole Malawi bird mentioned above was collected on 22 March at Fort Johnson (Benson 1953).

All records known to us are listed below (Tanzanian birds marked with an asterisk); since the bird is so little known we have appended wing-lengths of ringed birds as well as all available weights:

*no date, the type, Nguru, Kilosa District, Hartlaub (1891)
December, N. Uaso Nyiro, 2, van Someren (1932)
December, Nyambe Crater, Mt. Kenya, N. van Someren quoted by Jackson (1938)
4 December 1969, Ngulia, Tsavo, 3 collected by A. D. Forbes-Watson, now in the National Museum; weights: unsexed, 15.8 and 16g, male 17.5g
23 December 1969, Naivasha, 1 ringed (G.C.B.), wing 83 mm, weight 16.5g
22 January 1967, Naivasha, 1 ringed, J. B. Smart, wing 75 mm (worn)
26 January 1966, Kilifi, ♀ collected by A. D. Forbes-Watson for Smithsonian Institution, weight 16.6g
27 January 1966, Kilifi, 2 collected as above, weights ♂ 19.3g, ♀ 19.6g
*12 February 1921, Kilosa, ♀ collected, wing 80.5 mm, Friedmann & Loveridge (1937)
*24 March 1934, near Tanga, collected, Moreau & Moreau (1937)

The Basra Reed Warbler is probably a regular but uncommon winter visitor to the eastern part of our area. It has a very restricted breeding range according to Vaurie so that the total number of individuals must be small.

[*ACROCEPHALUS PALUDICOLA* Vieillot Aquatic Warbler

The Aquatic Warbler's winter quarters are unknown (Moreau 1961). It is not included by White but Vaurie suggests that it probably migrates to tropical Africa. Williamson (1968) is more definite stating that it "winters in tropical Africa".

A. G. T. Carter (*in litt.*) reports seeing a bird which he is sure was this species at Lake Naivasha on 7 January 1968. In view of the difficulty of identifying this species in the field and since no specimens are known from anywhere in the Ethiopian Region, we think it desirable that one be obtained or handled and photographed before admitting it to the avifauna of the Region.]

HIPPOLAIS ICTERINA (Vieillot) Icterine Warbler

Vaurie and White record the Icterine Warbler as wintering from Kenya south to northern Cape Province and southern Mozambique. Jackson (1938) gave a single record from Kenya, a male (now in the British Museum) collected on 23 March 1900 at Suguro in western Kenya. We have been able to trace only eight further records from our area (those from Tanzania are marked with an asterisk):

3 October 1959, seen Ngong Hills, H. Lee (MS in EANHS file)
*October, collected Rukwa Valley, Vesey-Fitzgerald & Beesley (1960)
*6 December 1922, ♀ collected Mwanza, Friedmann & Loveridge (1937)
*17 February 1962, ♀ collected Changana, Wembere, British Museum. The collector (B. W. H. Stronach) labelled the bird "Willow Warbler"; "*H. polyglotta*" had been added by another hand, but the wing is 77 mm and the bird is *icterina*.
*25 February 1922, ♀ collected Samumba, Singida, Friedmann & Loveridge (1937)
26 March 1967, 1 watched for at least half an hour, Maralal, J. B. Smart and G.C.B.
30 March 1940, Garabani Hill (= Emali), National Museum
13 April 1970, 5 seen Crescent Island, Lake Naivasha, C.F.M.

In addition, J. G. Williams tells us (*in litt.*) that it "occurs not infrequently at Lake Naivasha in spring".

The Icterine Warbler is more common in Central Africa than in our area. Pitman (1934) recorded it commonly at Kabwe (Broken Hill), Zambia from late November to January while Chapin (1953) states that it arrives near the equator (in Zaire) in September and leaves towards the end of April. Chapin (*op. cit.*) also observes that it has been noticed more often in southern Zaire than in the north.

We cannot explain the dearth of records from our area but think it unlikely that this comparatively conspicuous warbler could have been overlooked, especially by those operating with mist nets. It probably passes mainly west of our area on its way to and from winter quarters. With most records from February to April it may well use a more easterly route on return passage when it should be looked for especially.

HIPPOLAIS LANGUIDA (Hemprich & Ehrenberg) Upcher's Warbler

Recorded by Vaurie, White and Mackworth-Praed & Grant (1960) as wintering in Kenya and Tanzania but not further south. Van Someren (1922) had collected forty specimens from Kenya (Kisumu, Simba, Tsavo and Taveta), and Meinertzhagen (1922) records it from Lake Rudolf in March and the Taita Hills in December; he also mentions that Reichenow had specimens from Latema, near Taveta and from the Pare Mountains, north-eastern Tanzania. Jackson (1938) adds Doinyo Erok, Athi River, Wajir, northern Uaso Nyiro and Marsabit to the recorded localities. Williams (1967, 1969) omits Upcher's Warbler, probably because the species is difficult to identify in the field. Moreau (1937) mentions a record of one near Moshi (no details), and in the National Museum there is a female collected by Moreau on 13 April 1944 at Amani; we know of no toher records from Tanzania.

We have never encountered this species in any numbers although our personal knowledge of northern Kenya where Upcher's Warbler may be more common is very slight. This species is unlikely to be identified by casual bird-watchers since it is a rather drab bird and is, in any case, omitted by Williams (*op. cit.*) and Peterson *et al.* (1966). We know of few modern records from Kenya and none from Tanzania although Namanga (see below) is on the border:

5 December 1969, 1 collected Ngulia, A. D. Forbes-Watson, in National Museum
late December 1966, 3 seen Tsavo, D. J. Pearson (*in litt.*)
15 January 1966, 2 ringed Namanga, J. B. Smart
25 January 1954, ♂ Liboi, National Museum
13 February 1971, 1 ringed Lake Nakuru, D. J. Pearson (*in litt.*)
mid March—early April 1971, 1 seen Nairobi, A. D. Forbes-Watson *et al.* (*in litt.*)
20 March 1971, 1 ringed Athi River, D. J. Pearson (*in litt.*)
24 March 1947, ♀ Horr Valley, National Museum
1 April 1971, 1 ringed Athi River, G.C.B.

It is probable that Upcher's Warbler will be recorded more frequently in the north and east of Kenya but it cannot be common at Athi River or Nakuru where large numbers of Palaearctic warblers have been ringed.

HIPPOLAIS OLIVETORUM (Strickland) Olive-tree Warbler

Vaurie, White and Mackworth-Praed & Grant (1960) record this very large *Hippolais* from our area and south to the Transvaal. The total world population of this species must be rather small since it breeds only in the Balkans and parts of Asia Minor (Vaurie); moreover it is a drab bird unlikely to be noticed by casual bird-watchers in our area.

Jackson (1938) was able to quote only van Someren's (1922, 1932) records from Simba, Sagala, Chanler's Falls and Turkwell. Moreau (1937) did not include this species in his list of migrants to Tanzania and Vesey-FitzGerald & Beesley (1960) gave no records from the Rukwa. However, Beesley informs us (*in litt.*) that he obtained one there in December 1953 as well as seeing it at other times between October and January; he saw one in an Arusha garden on 4 October 1966 and another in Arusha National Park in March 1967. It should be mentioned that Meiklejohn (1940) saw a "probable" Olive-tree Warbler near Mwanza on 18 January 1940. There are no specimens in the National or British Museums and we know of no other Tanzania records. Like *H. languida*, this species may well be more common and regular in northern Kenya than the following records indicate:

21 November 1969, 1 ringed Ukwala, western Kenya, P.L.B.
late December 1970, widespread (seen) Lodungokwe, Barsalinga and Seya Valley, Samburu District, C.F.M.
9 January 1967, 1 seen Amboseli, D. J. Pearson (*in litt.*)
21 February 1971, 1 seen Ngulia, G.C.B.
5 March, 13 March—2 April 1961, Kitui: collected on first date; strong passage of this and/or *H. pallida* Hemprich and Ehrenberg on other dates, Tennent (1962 and MS in EANHS file)
25 April 1968, 1 found dead at Muguga (2300 m); another a few days later. These birds were found early in the morning by buildings which had been lit at night. W. G. Dyson (*in litt.*).

[*HIPPOLAIS POLYGLOTTA* Vieillot Melodious Warbler

White mentions one record from Bukoba, and Vaurie is clearly referring to this same bird when he writes "accidental ..... Lake Victoria". The Bukoba Melodius Warbler belongs to Sassi (1916) in which his total entry for this species, which normally winters in West Africa, is "♀ Bukoba XI. 1909". Grote (1930) and Moreau (1937) doubt this record and Chapin (1953) clearly puts little faith in it. In view of the lack of any supporting evidence, such as wing-length, we suggest that this record be rejected until the specimen can be located and re-examined. Williamson (1968) gives West Africa as the wintering area of this species but, under the heading "Moult" mentions "one from Uganda, 26. X". In the British Museum there is a bird collected by Capt. Pitman on 26 October at Nyhaabande, Kigezi, S. W. Uganda. The collector's label, No. 1406, has "*Hippolais ?polyglotta*, a few hunting insects in flowering Black Wattle". This bird is *H. icterina*: one wing is short by *c.* 10 mm, presumably shot; the other measures 70.5 mm with the first (i.e. outermost) primary 1.5mm longer than the primary coverts (G.C.B., confirmed by P. R. Colston).]

LOCUSTELLA FLUVIATILIS (Wolf) River Warbler

Vaurie records the River Warbler as migrating to eastern Africa south to the Zambezi, and occasionally to the Transvaal. White repeats this statement. Jackson (1938) was able to cite only three recorded localities, namely Nairobi, Kikuyu and Taveta. Williams (1967, 1969) does not mention this species while Mackworth-Praed & Grant (1960) say that it has been noticed as a rare Palaearctic winter visitor to Kenya.

From our modern records there is strong evidence to suggest that the River Warbler is, in fact, a passage migrant, at least to Kenya and probably also to northern Tanzania. Van Someren (1922) records it from Taveta and Nairobi giving no dates; two of Meinertzhagen's Taveta birds in the British Museum are dated December and these were given by Meinertzhagen (1922). There is a specimen in the National Museum from Naivasha in November.

A. D. Forbes-Watson (pers. comm.) drew our attention to a small passage of these birds, together with other Palaearctic warblers, in December 1969 at Ngulia; he collected a female weighing 20.0g on 2 December, a male weighing 15.5g the next day, and another male weighing 19.8 g on 5 December. Later the same month, G.C.B. ringed five more individuals at the same locality on 11-13 December, with weights 15g, 17.5g, 18g, 18g and 18g. The same locality was visited in December 1970 when G.C.B. ringed two, one on 13th and one on 14th, with weights 16.2g and 16.3g. Two of us investigated the Ngulia area in spring 1971 (late February and mid April) but very few migrants were present and, needless to say, no *L. fluviatilis* were seen or caught. The two spring records refer to specimens collected in late April: 21 April 1966 at Embakasi, Nairobi which is in the Paris Museum (kindly communicated by R. J. Dowsett) and 25 April 1968 at Arusha National Park (Beesley 1971a). The Embakasi record is interesting since, from March to early May 1971 many hundreds of Palaearctic warblers (and other passerines) were caught at Athi River, a locality very near Embakasi; yet no River Warblers came to hand.

The River Warbler is indeed an elusive bird; at Ngulia neither Forbes-Watson nor G.C.B. ever observed one except in, or just flying into a mist net. Most authors suggest that the bird's habitat is in swamps, which is surely suggested by the trivial and English names, but in G.C.B.'s experience at Ngulia the birds were in dry bush; the type locality in eastern Austria is woodland by the edge of the Danube.

PHYLLOSCOPUS COLLYBITA ABIETINUS (Nilsson) Chiffchaff

Vaurie gives the normal southern limit as 8°N. in eastern Africa (i.e. 400 km north of the Kenya border) but mentions that it has been collected once on Mt. Kenya (virtually on the equator). White mentions that it is found occasionally as far south as Mt. Kilimanjaro (3°S.), but Mackworth-Praed & Grant (1960) do not record it for East Africa. The sole record in Jackson (1938) is Kemp's bird from Rumuruti on 28 October 1910, which, according to Ticehurst (1938) is in fact *P. trochilus* Linn.

Meinertzhagen (1937) collected an example of the race *abietinus* in the bamboo zone of Mt. Kenya (3300m) on 10 February 1936, which was racially determined by Ticehurst, and it is likely that all East African birds belong to this form; Ticehurst (*op. cit.*) also mentions one from Tsavo in April 1918 racially determined by van Someren. The only other specimens we have traced are the three females from Tanzania in Moreau & Sclater (1935): January and March, Ngare Nairobi (1600m); 26 February, Bismark Hut, Kilimanjaro (2750m). All but one of our other records refer to singing birds in Kenya:

January 1964, heard (probable) Mau Narok, *c.* 2900 m, Sessions (1967)
20 January 1971, at least 3 heard Mt. Kenya, *c.* 3100m, Oliver *et al.* (1971)
February 1966, 1 seen and tape recorded at Mau Narok; tape recording confirmed by M. E. W. North. Sessions (1967)
9 February 1941, heard many times Mt. Elgon, *c.* 3100m, Benson (1945)
21 March 1971, 1 ringed (recaptured next day) Lake Kanyaboli, *c.* 1170m wing 58 mm, weight 6.7g, G.C.B. and P.L.B.

It is clear from the above records that the Chiffchaff's 'normal' African habitat is highland forest. The Lake Kanyaboli, Tsavo (probably less than 1000 m) and Ngare Nairobi birds are from

lower altitudes, but the Tsavo bird was probably on migration as, certainly, was the bird at Lake Kanyaboli. *Phylloscopus* warblers are only at all common at Lake Kanyaboli (regularly visited by P.L.B.) when there are 'falls' of migrants, mainly in November. This bird was netted with nine Willow Warblers *P. trochilus* on such an occasion, in acacia close to the lake shore. It may be relevant to mention that only 80km south of this locality there are the forested Gwasi Hills, hardly explored ornithologically, rising to over 2250 m, thus providing a suitable wintering habitat. Britton & Sugg (in press) failed to record it on Mt. Elgon between 24 December 1969 and 7 January 1970 but it is easily overlooked when not in song. Sharpe (1930a), who recorded it on Marsabit Mountain throughout the winter, said that they do not sing until after Christmas. At more than 2°N., the forest on Marsabit is an especially likely place for the Chiffchaff to winter regularly, as are other isolated areas of montane forest in northern Kenya. In the Chyulu Hills in southern Kenya van Someren (1939) noted both Chiffchafs and Willow Warblers frequently between 19 and 30 April in small forest patches. No Chiffchaffs were trapped at Athi River during spring 1971 although about 800 Willow Warblers were ringed there.

Thus the Chiffchaff is probably a regular winter visitor in small numbers to highland forest in Kenya and northern Tanzania. It should be looked for on Mts. Kenya, Kilimanjaro and Elgon, and in forest on Marsabit, Kulal, the Matthews Range and Nyiru in northern Kenya. (See Appendix.)

PHYLLOSCOPUS SIBILATRIX (Bechstein) Wood Warbler

Vaurie and White record the Wood Warbler south to the equator but do not mention any countries specifically; Ticehurst (1938) is more explicit, saying "N. Uganda and N. E. Kenya, barely south of the equator". Mackworth-Praed & Grant (1960) record it from Uganda and Kenya but give no precise details except that it is not usually common.

We have been unable to trace any satisfactory specimens at all from our area although there are two in the British Museum from Uganda, and Pitman (1931) noted "quite a number" (and collected one, now in the British Museum) on Nkose Island in mid December 1923; Nkose Island is at 0° 44'S., 32° 20'E., 200 km west of the Kenya border. Friedmann & Williams (1969) mention a male collected in forest close to the Tanzanian border in south-western Uganda on 13 February. We know of two Kenya sight records and two from Tanzania one of which is from over 6°S.: 8 September 1958 near Kibweza, Lake Tanganyika (Ulfstrand & Lamprey 1960); 3 October 1962, Mau Narok (Sessions 1967); Meiklejohn (1950) merely notes it in January from Mwanza but gives no precise details; 10 April 1971, Karen (J. G. Williams *in litt.*).

We admit the Wood Warbler to the avifauna of both Kenya and Tanzania, but with some reluctance for the latter country. Meiklejohn's (*op. cit.*) record is presented without any supporting evidence whatsoever and we do not consider that it should be included, especially as it was then the first record for Tanzania. The Kibweza sighting is also open to criticism: the locality is over 650 km south of the equator and the date (8 September) is very early for a Palaearctic passerine, other than a Swallow *Hirundo rustica* Linn., to be so far south. It should be noted that the observer (Ulfstrand) claims to be extremely familiar with the species in Sweden (see Ulfstrand & Lamprey *op. cit.*).

The Wood Warbler must surely occur more frequently in Kenya and north-western Tanzania than the above records suggest, however we should mention that many Willow Warblers *P. trochilus* Linn. are very white below so that pure sight records, as distinct from birds handled for ringing, should be supported by full field notes. (See Appendix.)

[*SYLVIA CANTILLANS ALBISTRIATA* (Brehm) Subalpine Warbler

White records the Subalpine Warbler from northern Tanzania, and Mackworth-Praed & Grant (1960) call it a rare and local winter visitor to coastal Tanzania. Vaurie does not mention the species south of Somalia. The reference to its occurrence in Tanzania seems to have been originated by Hartert (1910) and repeated by Sclater (1930) and Grote (1930). Hartert (*op. cit.*) gave no specific record for East Africa, neither did Reichenow (1900-03). Since we know of no records of this species from East Africa, or even Ethiopia (Urban & Brown 1971), we follow Moreau (1937) in rejecting this species. The Subalpine Warbler should be deleted from Backhurst & Backhurst (1970) and Forbes-Watson (1971).]

[*SYLVIA HORTENSIS CRASSIROSTRIS* (Cretzchmar) Orphean Warbler

Both White and Mackworth-Praed & Grant (1960) record this race of the Orphean Warbler from Kenya; but Vaurie, and all other authors consulted, including Sclater (1930), make no mention of this species from our area. It does, however, occur in Ethiopia (Vaurie, Urban & Brown 1971). This species should be removed from the Kenya list and therefore deleted from Backhurst & Backhurst (1970) and Forbes-Watson (1971).]

CERCOTRICHAS GALACTOTES (Temminck) Rufous Bush Chat (Rufous Warbler)

Two races, *syriacus* Hemprich & Ehrenberg and *familiaris* Ménétries, occur in our area, at least in Kenya. Vaurie records both races to Kenya, and White and Mackworth-Praed & Grant (1960) extend the range to north-eastern Tanzania.

The Rufous Bush Chat is recorded fairly often in the early literature (see below) but rarely nowadays: for example, none has ever been caught during ringing operations. Van Someren (1932) had twenty-six specimens of *syriacus* from south-eastern and northern Kenya collected between October and March, as well as an unspecified number of *familiaris* from unspecified localities between January and April, with one in June; the *familiaris* were determined by Hartert. Jackson (1938) had five recorded localities for *syriacus* in eastern Kenya and three for *familiaris* in the north and east. In the National Museum there are but two specimens from Kenya and none from Tanzania: 12 November, immature male, Emali; 15 April 1943, male Balambala, Garissa. There are also the following recent sight records from Tsavo East National Park: 3 January 1970 (C.S.M.); 26-27 March 1967, four seen Aruba (A. D. Forbes-Watson *in litt.*); 7 April 1971, Lugard's Falls (P.L.B.). Moreau (1937) was able to quote only two records from Tanzania, both in the north-east and both *syriacus*: a male at Mao on 19 November 1931 (Sclater & Moreau 1933), and at Masinde (Sclater 1930); however Moreau (1937) added that it was "probably not uncommon in the thorn bush inland towards Kilimanjaro".

The Rufous Bush Chat may be more common in the north and east of our area than the few modern records suggest; these areas, which are comparatively neglected nowadays, provided most of the earlier records. As Moreau (1937) has pointed out, this species could be confused in the field with local species of *Cercotrichas*. For example, it was only after some effort that the above mentioned Lugard's Falls bird was seen sufficiently well to be identified.

IRANIA GUTTURALIS (Guérin) White-throated Robin

Vaurie, White and Mackworth-Praed & Grant (1960) record this species from Kenya south to central Tanzania. Jackson (1938) recorded it as uncommon and gave six eastern Kenya localities, while Moreau (1937) could only quote Loveridge's male and female specimens from Dodoma on 22 December 1918 for the whole of Tanzania (Friedmann & Loveridge 1937).

We can add the following unpublished records:

December 1969, 1 seen Ngulia, A. D. Forbes-Watson (pers. comm.)
13 December 1970, 1 ringed Ngulia, G.C.B.
23 February 1941, Naberera, Tanzania, H.F.I. Elliott (*in litt.*)
14 March 1971, ♂ ringed, Athi River, G.C.B.
26 March 1971, ♂ ringed, Athi River, recaptured next day, G.C.B.
April 1971, one present in a Nairobi garden, D. A. Turner (pers. comm.)
spring 1966, immature male trapped, Athi River, Smart (1967)

Irania, although a strikingly coloured bird is, nevertheless, rarely seen; at Ngulia in December 1970 and at Athi River in 1971 G.C.B. saw none in the field. It is likely that more records of *Irania* will come to light in the future from eastern Kenya.

PHOENICURUS PHOENICURUS PHOENICURUS (Linn.) Redstart

Vaurie and White record the Redstart south to northern Kenya while Mackworth-Praed & Grant (1960) extend the range to north-western Tanzania, adding that it is only casual in Kenya and that very few records are known from Tanzania. Van Someren (1932) had only one specimen from present-day Kenya (Turkwell). Jackson (1938) also quoted only one, a male at Weiwei River (Turkana) on 9 January 1913. There is also a (presumed) sight record from Eldama Ravine on 11 October 1928 (Anon. 1930). The sole record from Tanzania is one at Bukoba in December (Reichenow 1903). We can add the following modern records from Kenya:

12 October 1969, ♀ ringed Ng'iya, P.L.B.
1 December 1968, 2 immature ♂♂ ringed Ng'iya, P.L.B. and J. F. Harper
8-13 December 1955, 1 seen Nairobi garden, H. Williams (MS in EANHS file)
28 January 1971, ♂ seen Sawagongo, Yala, P.L.B.
7 February 1971, 1 seen Kaptagat, C.F.M.
19 and 22 February 1969, one ♂ of 1 December 1968 was recaptured at Ng'iya on these two days, P.L.B.
24 March 1967, 1 seen Lake Kisima, J. B. Smart (pers. comm.)

The Redstart is probably a regular winter visitor in small numbers to the north-west of our area, south to about the equator. It can be no more than a mere straggler as far south and east as Nairobi. The single record from Tanzania is in the extreme north-west of the country, on the western shore of Lake Victoria at 1° 39'S.

APPENDIX

Through the courtesy of Dr George E. Watson we have been sent by airmail copies of the paper "Systematic notes on a collection of birds from Kenya" by S. D. Ripley & G. M. Bond (*Smithsonian Contributions to Zoology* Number 111: 1-21) published in November 1971. They report some interesting Palaearctic birds details of which are given below.

1. Additional species to be added to the Systematic List

CALANDRELLA CINEREA LONGIPENNIS (Eversmann) Short-toed Lark.

Vaurie does not record this race of Short-toed Lark for Africa, whereas White, who treats it as a race of *C. brachydactyla* (Leisler), gives the winter range as south to Eritrea and ex-British Somaliland. We have overlooked an early record of this bird mentioned in Jackson (1938): one was collected on 14 November 1899 at Athi River by Lord Delamere. We are most grateful to A. D. Forbes-Watson for drawing our attention to this record.

The second East African record is given by Ripley & Bond: one collected on 19 December 1964 at Ukundu (=Ukunda) airstrip, 4° 17′S., 39° 34′E. by A. D. Forbes-Watson. The species is not recorded from Tanzania.

2. Additional records

FICEDULA HYPOLEUCA HYPOLEUCA (Pallas) Pied Flycatcher

The bird referred to on page 24 was a young male collected in the Kakamega Forest on 8 December 1965 by A. D. Forbes-Watson.

PHYLLOSCOPUS COLLYBITA ABIETINUS (Nilsson) Chiffchaff

A female obtained by A. D. Forbes-Watson in Kakamega Forest in March or December 1965: the exact date is not given by Ripley & Bond.

PHYLLOSCOPUS SIBILATRIX (Bechstein) Wood Warbler

A male obtained by A. D. Forbes-Watson in Kakamega Forest mentioned by Ripley & Bond is the first Kenya specimen known to us. Unfortunately Ripley & Bond give no precise date—they deal with seven *Phylloscopus* skins which were collected in March and December 1965 in Kakamega. It should be noted that Ripley & Bond state that the Chiffchaff and Wood Warbler "are difficult to observe and are represented by only a few specimens from Kenya."; this implies that there are other specimens of the Wood Warbler in the United States, which are, as far as we know, undocumented.

ACKNOWLEDGEMENTS

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GAZETTEER

K=KENYA T=MAINLAND TANZANIA U=UGANDA Z=ZANZIBAR

		Lat.° ′	Long. ° ′
AHERO	K	0.11 S.	34.55 E.
ALBERT, LAKE	U	1.40 N.	31.00 E.
AMANI	T	5.06 S.	38.38 E.
AMBOSELI, LAKE	K	2.37 S.	37.08 E.
ARUBA	K	3.21 S.	38.49 E.
ARUSHA	T	3.22 S.	36.41 E.
ARUSHA CHINI	T	3.35 S.	37.20 E.
ARUSHA NATIONAL PARK	T	3.13 S.	36.34 E.
ATHI RIVER	K	1.27 S.	36.59 E.
ATHI RIVER (K.M.C. POOLS)	K	1.27 S.	36.59 E.
BALAMBALA (GARISSA)	K	0.05 S.	39.07 E.
BAMBURI (=BUMBURI)	K	3.59 S.	39.44 E.
BARINGO	K	0.38 N.	36.05 E.
BARSALINGA	K	0.55 N.	37.06 E.
BISMARK HUT	T	3.11 S.	37.32 E.
BUFFALO WALLOWS	K	*c.*3.14 S.	38.30 E.
BUKOBA	T	1.20 S.	31.49 E.
BURA	K	1.06 S.	39.57 E.
BUSENGA (=BUSENGE)	T	2.18 S.	32.16 E.
CENTRAL ISLAND	K	3.30 N.	36.03 E.
CHABULA SWAMP	T	unlocated: SE Lake Victoria.	
CHANGANA (WEMBERE)	T	4.30 S.	34.00 E.
CHYULU HILLS	K	2.35 S.	37.50 E.
CRESCENT ISLAND	K	0.46 S.	36.24 E.
DAR ES SALAAM	T	6.48 S.	39.17 E.
DIANI BEACH	K	4.18 S.	39.35 E.
DODOMA	T	6.11 S.	35.45 E.
ELDAMA RAVINE	K	0.03 N.	35.43 E.
ELDORET	K	0.31 N.	35.17 E.
ELGON, MOUNT	K	1.08 N.	34.33 E.
ELIYE POINT/SPRINGS	K	3.20 N.	35.57 E.
ELMENTEITA, LAKE	K	0.27 S.	36.15 E.
EL MOLO BAY	K	2.51 N.	36.42 E.
EMALI	K	2.05 S.	37.28 E.
EMALI HILLS	K	2.03 S.	37.22 E.
EMBAKASI	K	1.21 S.	36.54 E.
ENDEBESS	K	1.04 N.	34.59 E.
EYASI, LAKE	T	3.40 S.	35.05 E.
FERGUSON'S GULF	K	3.31 N.	35.55 E.
GEITA	T	0.35 S.	32.56 E.
GWASI HILLS	K	0.37 S.	34.09 E.
HORR VALLEY	K	2.10 N.	36.55 E.
INDANUGU RIVER (=NDARUGU R.)	K	1.07 S.	37.10 E.
IRINGA	T	7.46 S.	35.42 E.
IRIMA	K	3.17 S.	38.32 E.
ISHIARA	K	0.27 S.	37.47 E.
ITHANGA HILLS	K	1.01 S.	37.24 E.
ITUMBA	T	6.30 S.	33.45 E.
KABARNET	K	0.30 N.	35.45 E.
KABETE	K	1.16 S.	36.43 E.
KAKAMEGA FOREST	K	0.16 N.	34.53 E.
KANAMAI	K	3.55 S.	39.47 E.
KANDERE	K	3.22 S.	38.40 E.
KANYABOLI, LAKE	K	0.03 N.	34.10 E.
KAPSABET	K	0.12 N.	35.06 E.
KAPTAGAT	K	0.28 N.	35.29 E.
KAREMA	T	6.49 S.	30.26 E.
KAREN	K	1.20 S.	36.42 E.
KASAMA	ZAMBIA	10.10 S.	31.11 E.
KAVIRONDO	K	0.15 S.	34.35 E.
KAZIMA DAM (TABORA)	T	*c.*5.01 S.	32.48 E.
KENYA, MOUNT	K	0.10 S.	37.20 E.

KERIO RIVER	K	2.59 N.	36.07 E.
KIAMBU	K	1.10 S.	36.50 E.
KIBONDO	T	3.33 S.	30.30 E.
KIBWEZA (LAKE TANGANYIKA)	T	6.27 S.	29.57 E.
KIBWEZI	K	2.26 S.	37.53 E.
KIKAMBALA	K	3.53 S.	39.47 E.
KIKUYU	K	1.15 S.	36.40 E.
KIKUYU FOREST	K	0.55 S.	36.40 E.
KILIFI	K	3.38 S.	39.51 E.
KILIMANJARO, MOUNT	T	3.04 S.	37.22 E.
KILOSA	T	6.50 S.	36.59 E.
KINANGOP (PLATEAU)	K	0.42 S.	36.34 E.
KISAKI DAM (Nr. KONDOA IRANGI)	T	4.35 S.	35.53 E.
KISIMA, LAKE	K	0.56 N.	36.47 E.
KISMAYU	SOMALIA	0.25 S.	42.31 E.
KISUMU	K	0.06 S.	34.45 E.
KITUI	K	1.22 S.	38.01 E.
KIUNGA	K	1.45 S.	41.29 E.
KOROLI	K	2.43 N.	37.17 E.
KORONLI WATER	K	2.43 N.	37.42 E.
LAMU	K	2.17 S.	40.52 E.
LANET	K	0.18 S.	36.08 E.
LANGATA	K	1.20 S.	36.43 E.
LAROPI	U	3.34 N.	31.49 E.
LATEMA	K/T	3.24 S.	37.37 E.
LELAN DOWNS	K	1.17 N.	35.27 E.
LESSOS	K	0.13 N.	35.18 E.
LIBOI	K	0.25 N.	40.55 E.
LIMURU	K	1.06 S.	36.39 E.
LODUNGOKWE	K	0.54 N.	37.00 E.
LOIENGALANI	K	2.46 N.	36.43 E.
LOITA	K	1.40 S.	35.50 E.
LOKITAUNG	K	4.16 N.	35.45 E.
LONDIANI	K	0.10 S.	35.36 E.
LONGONOT, MOUNT	K	0.55 S.	36.27 E.
LOWER KABETE	K	1.14 S.	36.43 E.
LUGARD'S FALLS	K	3.03 S.	38.42 E.
LUMBWA	K	0.12 S.	35.28 E.
MAFIA ISLAND	T	7.50 S.	39.50 E.
MAGADI, LAKE	K	1.52 S.	36.17 E.
MAKUIWA, UNLOCATED, ON Mt. ELGON	K	0.08 N.	34.33 E.
MALINDI	K	3.17 S.	40.07 E.
MANDA (LAKE MALAWI)	T	10.30 S.	34.37 E.
MANYANI	K	3.05 S.	38.30 E.
MANYARA, LAKE	T	3.35 S.	35.50 E.
MARAGOLI HILLS	K	0.00	34.40 E.
MARALAL	K	1.06 N.	36.42 E.
MASANJE ISLAND	T	1.55 S.	33.25 E.
MARSABIT	K	2.17 N.	37.57 E.
MASINDE	T	3.39 S.	37.26 E.
MAU NAROK	K	0.41 S.	35.57 E.
MAUNGU	K	3.33 S.	38.45 E.
MBALAGETTI RIVER	T	2.12 S.	33.49 E.
MBUYUNI	K	3.24 S.	37.52 E.
MERU, MOUNT	T	3.14 S.	36.45 E.
MEURESSI (=MURUETHI)	K	2.56 N.	35.26 E.
MIDA	K	3.22 S.	39.58 E.
MILEPA (RUKWA)	T	8.04 S.	31.56 E.
MOMBASA	K	4.03 S.	39.40 E.
MOROGORO	T	6.49 S.	37.40 E.
MOLO RIVER, LOWER	K	0.15 N.	36.06 E.
MOSHI	T	3.21 S.	37.20 E.
MSARA	K	3.25 S.	39.34 E.
MTITO ANDEI	K	2.41 S.	38.10 E.
MUGUGA	K	1.11 S.	36.37 E.
MUTHAIGA	K	1.15 S.	36.49 E.
MWANZA	T	2.31 S.	32.54 E.
MWEA	K	1.42 S.	37.30 E.

NABERERA	T	4.12 S.	36.56 E.
NAIROBI	K	1.17 S.	36.49 E.
NAIROBI DAM	K	1.19 S.	36.48 E.
NAIROBI NATIONAL PARK	K	1.22 S.	36.50 E.
NAIVASHA, LAKE	K	0.46 S.	36.21 E.
NAKURU, LAKE	K	0.22 S.	36.05 E.
NAMANGA	K	2.33 S.	36.47 E.
NAMURAPUTH	K	4.34 N.	35.57 E.
NANYUKI	K	0.01 N.	37.04 E.
NATRON, LAKE	T	2.25 S.	36.00 E.
NDUNDU (RUFIJI)	T	8.14 S.	39.11 E.
NGARE NAIROBI	T	3.03 S.	37.01 E.
NG'IYA	K	0.03 N.	34.23 E.
NGONG HILLS	K	1.24 S.	36.38 E.
NGORONGORO, CRATER	T	3.10 S.	35.35 E.
NGULIA	K	3.00 S.	38.13 E.
NGURU	T	6.38 S.	37.32 E.
NJOMBE	T	9.20 S.	34.46 E.
NJORO	K	0.20 S.	35.56 E.
NORTH UASO NYIRO	K	0.28 N.	39.55 E.
NUNGWI	Z	5.43 S.	39.18 E.
NYAMBE CRATER, ON Mt. KENYA	K	0.10 S.	37.20 E.
OLDUVAI	T	2.58 S.	35.22 E.
OL BOLOSSAT	K	0.09 S.	36.26 E.
OL DONYO SABUK=OL DOINYO SAPUK	K	1.08 S.	37.15 E.
OL JORO OROK	K	0.04 S.	36.22 E.
PEMBA ISLAND		5.10 S.	39.48 E.
RABAI	K	3.56 S.	39.34 E.
RONGAI	K	0.10 S.	35.51 E.
RUAHA NATIONAL PARK	T	8.58 S.	35.25 E.
RUARAKA	K	1.14 S.	36.53 E.
RUDOLF, LAKE	K	3.30 N.	36.00 E.
RUIRU	K	1.09 S.	36.58 E.
RUKWA	T	8.00 S.	32.25 E.
RUMURUTI	K	0.16 N.	36.32 E.
SABAKI RIVER	K	3.09 S.	40.08 E.
SAMUMBA (SINGIDA)	T	4.49 S.	34.45 E.
SANYA	T	3.35 S.	37.05 E.
SAWAGONGO	K	0.05 N.	34.27 E.
SEMINI'S DAM (S. KINANGOP)	K	*c.*0.43 S.	36.39 E.
SEYA VALLEY	K	1.08 N.	37.04 E.
SHEKANI (=SHAKANI)	K	1.47 S.	41.29 E.
SHIMBA HILLS	K	4.13 S.	39.25 E.
SIMBA	K	2.10 S.	37.36 E.
SIO RIVER	K	0.14 N.	34.01 E.
SOBO	K	3.04 S.	38.54 E.
SOKOKE FOREST	K	3.31 S.	39.49 E.
SOLAI	K	0.03 N.	36.09 E
SOUTH UASO NYIRU	K	2.04 S.	36.07 E
SOY	K	0.41 N.	35.11 E.
SUGURO	K	Western Kenya, unlocated.	
SUGUTA NAIBOR	K	*c.*0.40 N.	36.37 E.
SUKARI	K	1.15 S.	37.06 E.
SULTAN HAMUD	K	2.02 S.	37.22 E.
SUSWA	K	1.09 S.	36.21 E.
TABORA	T	5.02 S.	32.50 E.
TANGA	T	5.04 S.	39.06 E.
TARANGIRI	T	4.00 S.	36.00 E.
TAVETA	K	3.25 S.	37.42 E.
THIKA	K	1.03 S.	37.05 E.
TIWI RIVER	K	4.14 S.	39.36 E.
TODANYANG	K	4.32 N.	35.56 E.
TSAVO	K	2.59 S.	38.31 E
TSAVO GATE	K	2.59 S.	38.31 E.
TULAZU RIVER (=TULASHA R.)	K	0.30 S.	36.24 E.
UASIN GISHU	K	0.30 N.	35.20 E.
UGALLA RIVER GAME RESERVE	T	5.50 S.	31.50 E.
UKEREWE ISLAND	T	2.03 S.	33.00 E.

UKWALA	K	0.12 N.	34.11 E.
ULUGU (USHORA)	T	4.41 S.	34.15 E.
UPLANDS	K	1.03 S.	36.39 E.
VOI	K	3.23 S.	38.34 E.
WAJIR	K	1.45 N.	40.04 E.
WATAMU	K	3.21 S.	40.01 E.
WEMBERE (Nr. LOLANGURU)	T	4.30 S.	34.00 E.
WITU	K	2.23 S.	40.26 E.
YALA RIVER	K	0.04 N.	34.09 E.
YALA RIVER SWAMP	K	0.03 N.	34.05 E.
YATTA PLAINS	K	2.00 S.	38.00 E.
ZANZIBAR	Z	6.10 S.	39.20 E.

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THE BIRDS OF BUDONGO FOREST, BUNYORO PROVINCE, UGANDA

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From 1966 to 1970, under sponsorship of National Science Foundation grants GB 5107 and GB 7787, the Los Angeles County Museum of Natural History made surveys of the fauna of the little known and dwindling isolated forests of western Uganda. The present report, dealing with the birds of the Budongo, completes the reports of the avifauna.

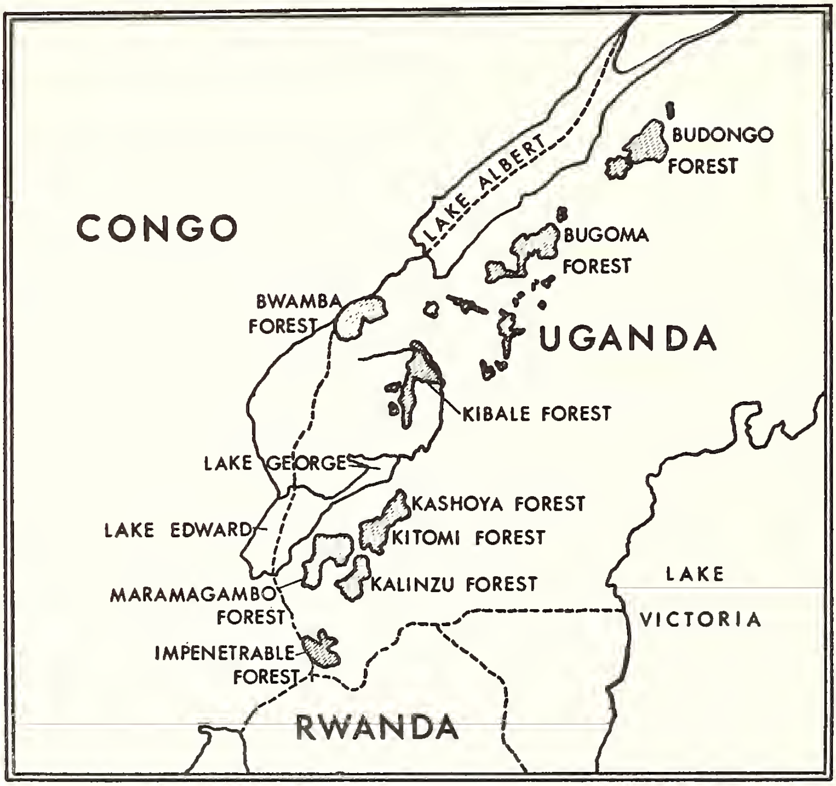
In Budongo, two surveys were made under the supervision of the junior author, who himself accompanied the first one. These trips lasted from 14th June to 8th July 1966, and from 12th April to 4th June 1970. On the first survey the collectors were John G. Williams and Andrew Williams; on the second trip A. Williams, Ivan Bampton and Anthony Ziegler were involved. The first trip unfortunately came at a time of some political unrest which precluded the bringing of firearms into Uganda, and collecting was, therefore, limited to the use of mist nets. A second, longer trip in 1970 completed the results of the 1966 survey.

The total bird collections, all in the Los Angeles County Museum of Natural History, comprise 933 specimens, which, together with 356 received from the Knudsen-Machris 1963 Expedition a few years earlier, has given us for study some 1289 specimens of 181 species. In addition, the Western Foundation of Vertebrate Zoology has made available nearly 100 Budongo bird specimens, which include four species not otherwise known from that area. We are glad to acknowledge our gratitude to the Western Foundation for this generous cooperation. The present report adds 32 species to the published Budongo avifauna, but only 128, or a little more that half of the total of 226 kinds of birds listed are actually true forest species, and some of them are more in the fringes than in the depths of the evergreen woodlands. The Budongo Forest has no endemic species or subspecies of birds peculiar to itself.

The Budongo Forest, in western Bunyoro province, Uganda, covers an area between the northeastern portion of Lake Albert, to the west, and Masindi, to the east. It extends from 1° 40′N. to 1° 53′N., 31° 25′E., to 31°41′E., and lies at an altitude of 900 to 1400 m. In an ecological study of the forest, Eggeling (1947) concluded that it differed from all the other west Ugandan forests in having a high percentage of mixed forest, not dominated

by any one kind of tree. This he considered indicates that the Budongo is biologically a younger forest than are those of Bugoma, Kalinzu, Kibale (Mpanga), Malabigambo and Bwamba. Eggeling did not estimate the relative difference in age of the Budongo from that of these other forests. The birds inhabiting these several areas give little information that might be suggestive in this consideration as no species or even subspecies is known to be restricted to any one of them.

The data of primary interest in the report are those devoted to the forest dwelling birds of Budongo. While we have included in this paper information on other species of birds obtained by our collectors just outside, or on the edge of, or in the clearings within, the forest, each of these are explicitly stated to be birds of the more open areas. Hall & Moreau (1970) have indications of actual records from, or close to, Budongo for three passerine forest species not included in the present paper. It is probable that these are from the Budongo Forest, but because we lack precise data on them we list them here rather than in their proper systematic sequence in the body of this paper: *Phyllastrephus hypochloris* (Jackson) Toro Olive Greenbul, *Ploceus weynsi* (Dubois) Weyns' Weaver and *Malimbus erythrogaster* Reichenow Red-bellied Malimbe.



Forests of western Uganda.

The literature on the birds of the Budongo is small enough to enable us to combine the earlier reports with our present extensive collections. Some of the first collectors to visit the forest, such as Christy, Fox, Neave, Pitman and Seth-Smith, published little, but many of their notes and specimens have been included in Jackson (1938) and in Chapin (1932 to 1954). However, the earlier and greater source of data on Budongo birds is van Someren's 1922 paper, where, unfortunately, the discussion is reduced to the mere listing of Budongo as a locality of specimen records for the species involved. The work

accomplished by van Someren and Jackson provided the chief published information about the avifauna of Budongo until 1963. In that year, the Knudsen-Machris Expedition spent a short time in the forest and added 60 species to the 131 recorded by their predecessors. This showed how incomplete the earlier published data were, especially since more than half of the additions were true forest birds. Since then Keith (1968) added sight records of three more species to the known avifauna of the Budongo, either his own or those of R. W. Smart. The present paper adds specimen records of 32 more, a total of 226 species. Of these, however, only 128 are denizens of the true forest. In comparing the present Budongo catalogue with the earlier data of van Someren and Jackson, it should be said that this increase is due to the use of mist nets as a supplemental collecting technique. Not only has their use enabled collectors to add many species to the local list, but it also has revealed the status of others previously considered rare because they are secretive, skulking, and difficult to obtain by the older methods alone. Additional Budongo records may lie unpublished in some museums, especially those of London, Nairobi, New York and Chicago. We have not had the opportunity to search for such in the course of our own present study.

To avoid repetition, we have deleted the year 1922 in all van Someren references to that paper (not his 1932 one); also the year 1938 for all Jackson references, save in the case of a few gamebirds where it is necessary to distinguish this book from his 1926 one. Also we have abbreviated the Knudsen-Machris 1963 Expedition to K. M. Expedition, and have deleted author and year from references to the senior author's paper on its results.

For her generous volunteer services in tabulating all the specimens with their data for the senior author's use while writing this report, and later for her careful and accurate typing of the manuscript, we are much indebted to Mrs. Reese H. Taylor.

In the following annotated catalogue the names of species that are new records for the Budongo area are followed by an asterisk. Those that we consider to be true forest dwellers are given the symbol F.

Podiceps ruficollis capensis Salvadori — Little Grebe *

One adult male with slightly enlarged testes was taken on 16th May; stomach contents insect remains. This is not a forest bird and was one of several found on a dam at the edge of the forest.

Butorides striatus atricapillus (Afzelius) — Green-backed Heron *

One adult male with enlarged gonads was taken on 18th April; stomach contents fish and beetle remains. This little heron does not occur in the forest but only along the marginal tree-bordered streams. It was collected at the dam mentioned under the preceding species.

Polyboroides radiatus typus Smith — Harrier-Hawk *F

Represented by an adult female, in non-breeding state, taken on 25th May.

Accipiter badius sphenurus (Rüppell) — Shikra

Not met with by our collectors, but noted by Jackson whose specimen must have been taken outside the true forest.

Kaupifalco monogrammicus (Temminck) — Lizard Buzzard *F.

This occurs more at the periphery than in the depths of the woodlands. One adult female, with a slightly swollen ovary, taken on 28th May had grasshoppers in its stomach.

Hieraaetus dubius (Smith) — Ayres' Hawk Eagle F.

As we noted in an earlier paper (1968:12) the junior author made an "unmistakable" sight record of this species on 14th June 1966.

Francolinus lathami schubotzi Reichenow — Forest Francolin F.

This small francolin is reported by van Someren (31), Jackson (1926:54, 1938:259) and White (1965:68).

Francolinus nahani Dubois — Nahan's Francolin F.

This is another rarely encountered species; an adult female with much enlarged ovary was taken on 16th April, stomach contents seeds and insect fragments. The K.M. Expedition (15) obtained a female in breeding condition in April.

Francolinus squamatus schuetti Cabanis — Scaly Francolin F.

Collected by the K.M. Expedition (16).

Guttera edouardi sethsmithi Neumann Crested Guinea Fowl F.
Fairly common; in May our collectors obtained two adults, stomach contents vegetable remains and grit.

Sarothrura pulchra centralis Neumann White-spotted Crake *F.
Quite common; our collectors obtained six specimens, 30th May to 6th July. A female was in full breeding condition on 31st May, others had small or only somewhat enlarged gonads; stomach contents insect fragments and grit.

Porphyrio alleni Thomson Allen's Gallinule*
Not a forest dweller; a male was taken on 6th July 1970 between Budongo Forest and Masindi.

Gallinula angulata Sundevall Lesser Moorhen *
One adult was captured in a mist net stretched across a small dam at the edge of the forest, June 1966, but escaped while being removed from the net.

Columba unicincta Cassin Afep Pigeon *F.
An adult female in breeding state was collected on 7th May, adding this large pigeon to the known avifauna. Its stomach was full of small green fruits.

Streptopelia semitorquata (Rüppell) Red-eyed Dove
Common in the Budongo area, but not in the depths of the forest. Our collectors did not meet with it; Budongo records were mentioned by van Someren (37), Jackson (1926:145, and 1938:457), and the K. M. Expedition (17).

Turtur tympanistria (Temminck) Tambourine Dove F.
Very common; ten specimens were taken in late April, May and June, all with enlarged gonads; a female collected 16th June was marked as "breeding". All the specimens had seeds and comminuted vegetable matter as well as grit in their stomachs.

Turtur afer (Linnaeus) Blue-spotted Wood Dove *
Less numerous than the preceding species; our collectors obtained a female with an enlarged ovary in the open woods west of the true forest on 19th May; stomach contents hard seeds and grit.

Aplopelia larvata jacksoni (Sharpe) Western Lemon Dove F.
Recorded by Jackson (1926:176, and 1938:473) and Chapin (1939:166), probably on the basis of Jackson's reports.

Treron australis gibberifrons (Madarasz) Green Pigeon F.
Known from two examples taken by the K. M. Expedition (17). Our collectors found it to be not uncommon, but obtained no specimens.

Psittacus erithacus erithacus Linnaeus Grey Parrot F.
Represented by an adult female, taken 20th May, ovary slightly enlarged; stomach contents pieces of hard brown fruit seeds and yellow fruit pulp. Noted by van Someren (46) and Jackson (532). Our collectors saw flocks of these birds flying high above the forest on several occassions.

Agapornis pullaria ugandae Neumann Red-headed Lovebird
Reported only by Jackson (540).

Tauraco schuetti emini (Reichenow) Black-billed Turaco F.
Known only on the basis of van Someren's record (49). It was noted a few times by our men as well.

Tauraco leucolophus (Heuglin) White-crested Turaco
Reported by van Someren (49), by Jackson (520) and the K. M. Expedition (17). Our 1966 and 1970 field workers did not collect it, but noted it not uncommonly outside the true forest.

Corythaeola cristata cristata (Vieillot) Great Blue Turaco F.
Collected by the K. M. Expedition (17). Our collectors saw it on a few occasions.

Clamator levaillantii (Swainson) Levaillant's Cuckoo
Not a forest species, but one example was collected on the edge of the forest on 30th April by the K.M. Expedition.

Cuculus solitarius solitarius Stephens Red-chested Cuckoo
Represented by one adult male, testes slightly enlarged, taken 16th May; stomach contents insects, including one hairy and one hairless caterpillar. The K.M. Expedition (18) also collected this cuckoo.

Cuculus clamosus gabonensis Lafresnaye Gabon Cuckoo F.
This forest cuckoo is known only from reports by van Someren (52) and Jackson (488), apparently of specimens in the *mabirae* plumage phase.

Cercococcyx mechowi Cabanis Dusky Long-tailed Cuckoo F.
Collected by the K. M. Expedition (18) and by our field party who obtained a breeding female with a not fully developed egg in the oviduct on 19th May; stomach contents ants, spiders, and large hairy caterpillars. It was fairly numerous but very elusive.

Chrysococcyx klaas (Stephens) Klaas' Cuckoo
Known only on the basis of one specimen taken by the K.M. Expedition (19).

Chrysococcyx cupreus cupreus (Shaw) Emerald Cuckoo F.
Our field party collected one adult of each sex, 25th April and 26th May; gonads slightly enlarged; stomach contents insect fragments, including termites, a dragonfly and hairy caterpillars. The K. M. Expedition also found it.

Ceuthmochares aereus aereus (Vieillot) Yellow-bill
First reported by the K.M. Expedition (19); our collectors obtained one female in non-breeding state, 22nd May; stomach contents insect fragments.

Centropus monachus fischeri Reichenow Blue-headed Coucal
Known from the immediate vicinity of the forest from a single specimen taken by the K.M. Expedition (19).

Otus scops senegalensis (Swainson) African Scops Owl
Reported only by van Someren (45); it is not a true forest bird.

Bubo africanus cinerascens Guerin Spotted Eagle Owl
Only known from one specimen taken by the K.M. Expedition (19) at the escarpment immediately west of the Budongo Forest. Not a real forest dweller, it does occasionally occur on the outer fringes of the wooded areas.

Bubo lacteus (Temminck) Verreaux's Eagle Owl F.
Found only by the K.M. Expedition (19).

Ciccaba woodfordii nuchalis (Sharpe) African Wood Owl F.
First recorded by van Someren (45), this owl was met with by our collectors on 7th May 1970, when an adult of each sex was obtained, both in non-breeding state; stomach contents large green grasshoppers and beetles.

Caprimulgus inornatus Heuglin Plain Nightjar *
A bird of fairly arid thorn scrub country which does not occur in the forest. In the collection of the Western Foundation of Vertebrate Zoology are four specimens collected by R. Glen in January 1966, all labelled from the Budongo Forest, but they must have been taken outside it. The specimens all had small gonads; stomach contents insect remains.

Macrodipteryx vexillarius (Gould) Pennant-wing Nightjar *
Like the preceding species, it does not occur in the true forest. Our 1970 collectors obtained three specimens, 2nd-6th July collected on roads through the forest.

Apus caffer streubelii (Hartlaub) White-rumped Swift
Recorded only by the K.M. Expedition (22).

Chaetura sabini Gray Sabine's Spinetail
Known on the basis of sight records only; Keith (1968:7-8) saw the species on a number of occasions in October 1963, and was informed by Robert W. Smart that he saw this swift regularly on numerous visits to Budongo, as also did the junior author.

Chaetura ussheri sharpei Neumann Mottled-throated Spinetail *
Our 1970 collectors obtained two adults on 17th and 30th May; stomach contents insect fragments. This swift occurs both in forested and savanna country.

Chaetura cassini Sclater Cassin's Spinetail
Reported only by Keith (1968:8) who observed it several times in October 1963, often in mixed flocks with *C. sabini*. Williams collected an adult female in near breeding state; 19th June 1968, specimen donated to the Los Angeles Museum collection.

Colius striatus kiwuensis Reichenow Speckled Mousebird
Occurs only at the forest edge, and was first obtained there by the K.M. Expedition (22). Our collectors took one male with swollen testes, 12th May; stomach contents green vegetable pulp.

Apaloderma narina brachyurum Chapin Narina's Trogon F.
Common in the Forest where specimens were obtained by van Someren's collectors (72) and by the K.M. Expedition. We have a series of specimens taken in April, May and June, all in non-breeding state; stomach contents various insect fragments including grasshoppers, stick insects and even a hairy caterpillar.

Ceryle maxima (Pallas) Giant Kingfisher *
Not a forest bird; our example, a male with enlarged testes, 29th June, was collected outside the forest, near the Sonso River; stomach contents remains of fresh water crabs. The species was seen several times at a dam on the edge of the forest.

Alcedo quadribrachys guentheri Sharpe Shining-blue Kingfisher *F
Collected only by our field parties in 1966 and 1970. We have eight specimens, 18th April to 7th July; two of these taken 23rd June and 7th July were breeding at the time, the others had small gonads; stomach contents fish scales and remains.

Ceyx picta picta (Boddaert) Pigmy Kingfisher
Very common, our 1966 and 1970 collectors took 16 examples; the K.M. Expedition collected three others. Neither van Someren nor Jackson met with this kingfisher, but it is not likely that it has only recently become numerous in the area. One of our birds, taken 18th April, had large gonads; the others had small ones; stomach contents insect fragments. On 18th April A. Williams collected a set of hard-set eggs.

Ceyx lecontei (Cassin) Dwarf Kingfisher F.
Another common kingfisher; reported by van Someren (79), by Eggeling (1936:243); by Jackson (566); by the K.M. Expedition (23), and by both our 1966 and 1970 collectors. We have 19 examples, one of which, a female, taken on 27th April was in breeding state; stomach contents in all cases consisted of crickets (mainly) and other insect fragments. Like the preceding species, this is predominantly a bird of clearings in the forest.

Halcyon senegalensis (Linnaeus) Northern Woodland Kingfisher *F.
Met with only by our 1966 and 1970 field parties, and six specimens were collected, 25th April to 8th July, all in non-breeding state; stomach contents insect fragments and, in one case, two unidentified small bones.

Halcyon malimbica malimbica (Shaw) Blue-breasted Kingfisher F.
A common bird reported by Jackson (571), the K.M. Expedition (23) and by both our 1966 and 1970 collecting parties. A dozen specimens, some with small, and some with large, gonads, were taken in April, May and June; stomach contents remains of insects and one millipede.

Halcyon badia Verreaux Chocolate-backed Kingfisher F.
Common and recorded by all who have published on the birds of the area. We have ten examples taken in April, May and July, mostly in non-breeding state, but one collected 29th April had enlarged gonads; stomach contents various insect fragments.

Halcyon chelicuti chelicuti (Stanley) Striped Kingfisher
Not a bird of the true forest, but two were collected, on the forest edge in April by the K.M. Expedition (23).

Halcyon leucocephala leucocephala (Müller) Grey-headed Kingfisher *
In the collection of the Western Foundation of Vertebrate Zoology is one specimen of this kingfisher taken by Robert Glen on 8th January 1966. No one else seems to have found it, it is not a forest bird.

Merops albicollis Vieillot White-throated Bee-eater
Reported by van Someren (81), Jackson 585) and the K.M. Expedition. The species is not a forest dweller, but comes to its outer fringes.

Merops variegatus loringi (Mearns) Blue-breasted Bee-eater
Known to occur on the fringes of the Forest where it has been reported by van Someren (80) and Jackson (590).

Eurystomus gularis neglectus Neumann Blue-throated Roller F.
First collected by the K.M. Expedition (24). Our collectors procured an adult male with small gonads on 13th May 1970; stomach contents insects, including a large flat beetle.

Bycanistes fistulator duboisi Sclater White-tailed Hornbill F.
This hornbill was reported by Keith (1968:9) on the basis of sight records by Robert W. Smart; Bwamba Forest is the only other Uganda locality for it.

Bycanistes cylindricus albotibialis Cabanis & Reichenow White-thighed Hornbill F.
The K.M. Expedition (25) collected an adult female.

Bycanistes subcylindricus subquadratus Cabanis Black-and-White Casqued Hornbill F.
Collected only by the K.M. Expedition (25). Our collectors in 1970 did not obtain this species, but saw it many times.

Lybius bidentatus aequatorialis (Sharpe) Double-toothed Barbet F.
Reported by van Someren (55), Jackson (700) and the K.M. Expedition (25).

Lybius hirsutus ansorgii (Shelley) Hairy-breasted Barbet F.
Listed by Jackson (702) and our 1970 collecting team procured a breeding female on 28th May; stomach contents fruit.

Buccanodon duchaillui duchaillui (Cassin) Yellow-spotted Barbet *F.
Not previously reported in print from the Budongo area, this barbet was collected there by Robert Glen, 10th to 16th January 1966, and 12th September 1963; these three males and a female, all in non-breeding state, are in the collection of the Western Foundation of Vertebrate Zoology.

Pogoniulus scolopaceus aloysii (Salvadori) Speckled Tinker-Bird F.
Fairly common; in 1970 our collectors obtained 3 examples, 9th to 14th May, all in non-breeding state; stomach contents insect fragments in one case, fruit remains in another. The species has been reported by Jackson (721) and the K.M. Expedition (26).

Pogoniulus bilineatus mfumbiri (Ogilvie-Grant) Lemon-rumped Tinker-Bird F.
Recorded by Jackson (717), and the K.M. Expedition (26).

Pogoniulus subsulphureus flavimentum (Verreaux) Yellow-throated Tinker-Bird F.
Reported by van Someren (59) and Jackson (721), and found to be fairly numerous by the K.M. Expedition (26). Our collectors also met with it and obtained a series of specimens, mostly in non-breeding state, but two males had enlarged testes, 18th May; stomach contents fruit seeds and pulp.

Trachyphonus purpuratus elgonensis Sharpe Yellow-billed Barbet F.
Found to be common by our collectors who procured 7 specimens, 25th April to 28th May; all with slight gonadal enlargements; stomach contents largely fruit pulp but in one instance a large brown nut. The species has been reported by the K.M. Expedition (26).

Indicator variegatus Lesson Scaly-throated Honey-Guide
Recorded by van Someren (53) and Jackson (734).

Indicator conirostris conirostris (Cassin) Thick-billed Honey-Guide F.
Known on the basis of one specimen taken by the K.M. Expedition (27).

Campethera nubica nubica (Boddaert) Nubian Woodpecker
Reported by Jackson (744), probably from open bush country outside the true forest.

Campethera caroli (Malherbe) Brown-eared Woodpecker F.
Very common; we have 12 specimens taken in April, May and June, all in non-breeding state; stomach contents insect fragments, chiefly black ants. This species was also reported from the Budongo by earlier expeditions.

Campethera nivosa herberti (Alexander) Buff-spotted Woodpecker F.
A common bird having been taken by all earlier collectors. We have 10 specimens, taken in April, May and June, in non-breeding state; stomach contents chiefly black ants.

Dendropicos fuscescens lepidus (Cabanis & Heine) Cardinal Woodpecker
Reported by van Someren (67) and Jackson (750), but probably found just outside the true forest.

Dendropicos poecilolaemus Reichenow Uganda Spotted Woodpecker
Another woodpecker of the open woodlands, not of the dense forest, this species was reported by van Someren (67) and Jackson (751).

Mesopicos xantholophus (Hargitt) Yellow-crested Woodpecker F.
Recorded by the K.M. Expedition (27-28). In May 1970, our collectors obtained 7 specimens, all in non-breeding state; stomach contents insect fragments, including ants, beetles and several sizeable grubs.

Pitta angolensis longipennis Reichenow African Pitta F.
Reported by van Someren (1932:286), Jackson (772) and Chapin (1953:26).

Pitta reichenowi Madarasz Green-breasted Pitta F.
Collected by the K.M. Expedition (28). Earlier it had been observed there by Pitman (Chapin, 1953:30), who found nests there in May 1943 and 1944. It may be mentioned here that an unfortunate lapse by Hall & Moreau (1970:409) has transposed the K.M. record of *Pitta reichenowi* to *Pseudocalytopmena graueri* Rothschild. The latter species has never been found in Budongo, and, since it is a highland bird, it is not to be expected there.

Smithornis rufolateralis budongoensis van Someren Red-sided Broadbill F.
Recorded by all earlier authors, but not met with by our collectors.

Riparia riparia riparia (Linnaeus) Sand Martin
Known only on the basis of two specimens obtained, not in the forest itself, but on the "Budongo Escarpment", by the K.M. Expedition (42).

Hirundo abyssinica unitatis Sclater & Praed — Striped Swallow
Not a forest bird, the few specimens obtained in "Budongo Forest" by the K.M. Expedition (42) and by our 1970 collectors must have been taken just outside the forest, or in a clearing within it. In 1970 a male in non-breeding state was collected on 18th April; stomach contents small insect fragments.

Psalidoprocne albiceps albiceps Sclater — White-headed Rough-wing *
Common on the forest edges where our collectors procured 8 specimens in July 1966 and May 1970, some with large and some with small gonads; stomach contents insect fragments.

Motacilla alba vidua Dumont — African Pied Wagtail
Listed by van Someren (182) and by Jackson (802); not a forest bird, and must have been taken just outside it.

Trichastoma albipectus barakae (Jackson) — Scaly-breasted Illadopsis F.
Common, our collectors obtained a good series in April and May, some with large and some with small gonads, a juvenile on 10th May, and an immature but fully grown one on 7th July; stomach contents insect fragments. Also recorded by van Someren (245), Jackson (843) and the K.M. Expedition (29).

Trichastoma rufipennis rufipennis Sharpe — Pale-breasted Illadopsis F.
Common; reported by van Someren (245), the K.M.. Expedition (29) and by our collectors in 1966 and 1970. A series taken in April and May includes birds with small gonads and others with large ones; stomach contents insect fragments.

Trichastoma fulvescens ugandae (van Someren) — Brown Illadopsis F.
Very common; we have 16 specimens taken in April, May and June, some with small, others with large gonads; stomach contents insect fragments, especially beetles; a female taken on 11th May was a juvenile bird. Recorded by earlier expeditions.

Turdoides plebejus cinereus (Heuglin) — Brown Babbler
Not a forest bird, this babbler figures in the avifauna on the basis of an example collected on the edge of the forest by the K.M. Expedition (29) and an earlier record by van Someren (234).

Turdoides melanops sharpei (Reichenow) — Black-lored Babbler
Not a forest bird, but was reported, undoubtedly from just outside the forest, by van Someren (234), Jackson (836) and Chapin (1953:235).

Pycnonotus barbatus tricolor (Hartlaub) — Dark-capped Bulbul
Reported by van Someren (189) and Jackson (851); our collectors obtained two males, 4th and 5th May 1970, at the forest edge; both with enlarged testes; stomach contents insect fragments with none of the fruits usually found in the diet of this species.

Pycnonotus virens holochlorus (van Someren) — Little Greenbul F.
Very common; reported by all earlier collectors. A long series of specimens was taken in April, May and July; some in breeding condition (16th June to 3rd July), while the April and May examples showed variations from small to large gonads; stomach contents remains of fruit and insects.

Pycnonotus gracilis ugandae (van Someren) — Little Grey Greenbul F.
Known on the strength of specimens reported by van Someren (188), Jackson (876) and the K.M. Expedition (30).

Pycnonotus curvirostris curvirostris (Cassin) — Cameroon Sombre Greenbul F.
This abundant greenbul is represented in our 1966 and 1970 collections by many specimens taken in April, May and July; two females were in breeding condition, 19th April and 3rd May; the rest had small or enlarged gonads; stomach contents fruit pulp, small fruits, caterpillars, ant pupae, and other insect fragments. All earlier collectors also recorded this greenbul.

Pycnonotus latirostris eugenius (Reichenow) — Yellow-whiskered Greenbul F.
Very common; found by all earlier collectors; our 1966 and 1970 collectors obtained 11 specimens in late April, May and early July; some with small and some with enlarged gonads; stomach contents fruit pulp and seeds, one orange coloured berry and some insect fragments.

Pycnonotus gracilirostris congensis (Reichenow) — Slender-billed Greenbul F.
Fairly common; our collectors obtained 3 males in May 1970, all showing testicular enlargement; stomach contents small fruits, some of wild figs. Noted earlier by van Someren (188), Jackson (875) and the K.M. Expedition (30).

Baeopogon indicator indicator (Verreaux) — Honeyguide Greenbul F.
Relatively uncommon; recorded by van Someren (186) and not again until our collectors procured a single specimen on 22nd May 1970; testes slightly enlarged; stomach empty. A specimen collected by Robert Glen, and originally thought to be *B. clamans* (Sjöstedt) (Report of the National

Museum, Nairobi, July 1965 to June 1966:18) is actually *B. indicator* with no dark markings on the outer tail-feathers.

Ixonotus guttatus bugoma Rand — Spotted Greenbul F.

Found to be common by our 1970 field party. It has been noted by Jackson (861). We have 7 specimens, taken 5th to 29th May, all in non-breeding state; stomach contents insect fragments, small black fruits, and parts of larger green fruits.

Chlorocichla flavicollis pallidigula (Sharpe) — Yellow-throated Leaflove F.

This bird appears to be less numerous than other greenbuls. Our collectors obtained one male on 15th June 1966, and one of each sex on 27th April and 5th May 1970, all in non-breeding state; stomach contents berries and small figs. Reported by van Someren (184 and 1932:342) and Jackson (858).

Phyllastrephus albigularis albigularis (Sharpe) — White-throated Greenbul F.

Abundant and recorded by all previous workers. We have a long series of specimens taken in 1966 and 1970, in April, May and June, none of them in breeding state although a few showed some gonadal enlargement; stomach contents beetle and other insect remains.

Phyllastrephus icterinus tricolor (Cassin) — Icterine Greenbul F.

Not uncommon, recorded by van Someren (186), Jackson (865) and Rand (1960:271). Our collectors procured 7 specimens in April, May and July, none in breeding condition, although one male, 18th April, showed considerable testicular enlargement; stomach contents ants and other insect fragments.

Phyllastrephus xavieri xavieri (Oustalet) — Xavier's Greenbul F.

This species, so very similar to the preceding one, may be slightly more abundant than it in the Budongo. Our collectors obtained a larger number of *xavieri* than of *icterinus*. The species had been reported by Chapin (1944:544, 1953:167), Rand (1960:271) and Friedmann (1966:31, 1968:110-112). At the time of van Someren's work, it was not possible to distinguish this greenbul from *icterinus*, as their differences, chiefly in size, were not understood prior to Chapin's 1944 study. Their degree of sympatry in the forests of Uganda was futher clarified by Friedmann (1968:110-112).

Our series of 10 examples taken between 29th April and 14th June, contained one breeding male (14th June) and one juvenile specimen (10th May), while the others were all birds with small or slightly enlarged gonads; stomach contents insect fragments.

Bleda syndactyla woosnami Ogilvie-Grant — Bristle-bill F.

Common; our collectors procured 15 specimens in April, May and June, some with small, others with enlarged gonads; one female taken 25th June was in full breeding condition; stomachs contained the remains of beetles and other insects. Reported by van Someren (183), Jackson (857) and the K.M. Expedition (32).

Nicator chloris chloris (Valenciennes) — Nicator F.

Common and noted by all previous writers except Jackson. Our collectors obtained 11 specimens between 26th April and 27th June. Two females, 28th April and 24th June, were marked as breeding; one, taken 14th May, was a juvenile; all the others were adults with gonads of varying degrees of enlargement; stomach contents fragments of various insects including grasshoppers and egg cases; the juvenile's stomach contained fruit pulp.

Criniger calurus emini (Chapin) — Red-tailed Greenbul F.

Very common; our collectors obtained 16 specimens between 22nd April and 5th July. All earlier Budongo records reported by van Someren (183), Jackson (856) and Friedmann (1966:32) were published as *C. ndussumensis* (Reich.). Hall & Moreau (1970:69, map 79), record only *C. calurus emini* east of Lake Albert. The two species are amazingly similar, differing only in the breadth of the bill.

Our series contains individuals with small, others with enlarged, gonads in about equal numbers; one female taken on 26th June was marked as "breeding"; an unsexed bird taken on 27th April was a juvenile; stomach contents entirely insect fragments including, in one instance, two ant pupae.

Campephaga phoenicea flava (Latham) — Black Cuckoo-Shrike

Reported solely by van Someren (106). It is not a bird of true forest, and must have been collected just outside it.

Muscicapa gambagae (Alexander) — Gambaga Flycatcher

Chapin (1953:641) lists this non-forest species from Budongo; nobody else seems to have reported it.

Muscicapa cassini Heine — Cassin's Grey Flycatcher *F.

Known only on the basis of a single male collected on 3rd July 1966 by our field party. It had the testes somewhat enlarged; stomach contents insects, including mayflies. The only other Uganda locality is the Kibale Forest.

Muscicapa sethsmithi (van Someren) Yellow-footed Flycatcher F.
Reported by all earlier expeditions; our collectors took six specimens in 1970 (30th April to 9th May), some with gonadal enlargement; others in non-breeding state; stomach contents insect fragments.

Muscicapa caerulescens brevicauda Ogilvie-Grant Ashy Flycatcher *
Our collectors procured four specimens in May 1970, the only ones yet reported. They include individuals with large and others with small gonads; stomach contents caterpillars, other insects, and, in one case, a single fruit seed.

Muscicapa griseigularis (Jackson) Grey-throated Flycatcher F.
Common, all collectors have obtained examples. We have 12 specimens with varying degrees of gonadal enlargement, and one juvenile; stomach contents insect fragments, including a small beetle.

Muscicapa comitata (Cassin) Dusky Blue Flycatcher F.
Known only on the basis of van Someren's report (96)

Muscicapa infuscata (Cassin) Sooty Flycatcher F.
Fairly common; the K.M. Expedition (33) met with it, and our collectors obtained 5 specimens in April, and May, some with enlarged and some with small gonads; stomach contents insect fragments.

Myioparus plumbeus plumbeus (Hartlaub) Grey Tit Flycatcher
Relatively uncommon along the edges of the Budongo Forest; it does not occur within the forest. Van Someren (206) and Jackson (907) reported it from the area; one specimen was taken by the K.M. Expedition (32)

Ficedula albicollis semitorquata (Homeyer) White-collared Flycatcher
Chapin (1953:647) reported a specimen taken in the Forest on 22nd February 1907 by L.M. Seth-Smith. This is the only record known to us.

Fraseria ocreata ocreata (Strickland) Forest Flycatcher F.
Obtained by both our collecting teams, as well as by the earlier expeditions. We have 4 specimens, all in non-breeding state, May and July; stomach contents beetles and other insect fragments.

Melaenornis edolioides lugubris (Müller) Black Flycatcher
Recorded by van Someren (93) and the K.M. Expedition (33).

Hyliota flavigaster flavigaster Swainson Yellow-bellied Flycatcher. F.
Known from Budongo on the authority of Jackson (905).

Megabyas flammulata flammulata Verreaux Shrike Flycatcher F.
Our collectors obtained one specimen in non-breeding state, 14th May 1970; stomach contents insect fragments. It has also been noted by the K.M. Expedition (33).

Batis minor nyanzae Neumann Black-headed Puffback Flycatcher
Recorded by van Someren (100); it is not a bird of the true forest but of more open bush country surrounding it.

Platysteira cyanea nyansae Neumann Wattle-Eye
Less numerous than its congeners, *castanea* and *blissetti*. Our collectors obtained a single example in June 1966, and two in May 1970; also recorded by van Someren (102). Our specimens were in non-breeding state; stomach contents insect fragments. This is a bird of the edges of the forest.

Platysteira peltata mentalis Bocage Black-throated Wattle-Eye.
This species must be even less common than *cyanea*.
The only records known to us are two specimens taken in May 1963 by the K.M. Expedition (34). Like the preceding species this is a forest edge bird.

Platysteira castanea castanea Fraser Chestnut Wattle-Eye F.
Very common and recorded by all earlier collectors. We have 16 specimens, April to July, some with enlarged gonads, some with small ones; stomach contents insect fragments.

Platysteira blissetti jamesoni (Sharpe) Jameson's Wattle-Eye F.
Very common and recorded by all previous collectors. We took 14 examples in April, May and July, some with large and some with small gonads; stomach contents insect fragments and butterfly eggs.

Erythrocercus mccalli congicus Ogilvie-Grant Chestnut-cap Flycatcher F.
Common, and reported by all earlier authors. Our collectors obtained 7 examples in May 1970, one with enlarged and others with small gonads; stomach contents insect fragments including, in one case, a caterpillar.

Trochocercus longicauda teresitus (Antinori) Blue Flycatcher
Recorded by van Someren (102) and the K.M. Expedition (34). Our collectors did not meet with it. It is a bird of the clearings inside the forest and of the forest edges.

Trochocercus nigromitratus (Reichenow) Dusky Crested Flycatcher F.
Common and all previous writers have reported it. We have 16 examples taken from April to July, mostly with small gonads, but one, taken on 26th June was in breeding condition; stomach contents insect fragments.

Terpsiphone rufiventer somereni Chapin Black-headed Paradise Flycatcher F.
Very common, all previous authors have reported it, and our collectors obtained 17 examples in 1966 and 1970, April to June, most with enlarged gonads; stomach contents insect fragments.

Terpsiphone viridis ferreti (Guerin) Paradise Flycatcher F.
Reported from Budongo only by van Someren (104, 105) and Jackson (943).

Alethe diademata woosnami Ogilvie-Grant Fire-crest Alethe F.
In 1966 and 1970 our collectors found this thrush to be abundant and collected 25 specimens April to July, many in breeding state, others with small gonads. The K.M. Expedition (36) was the first to add this species to the known Budongo fauna. Our specimens had eaten ants, beetles and other insect fragments as well as small frogs (in at least two cases).

Alcthe poliocephala carruthersi Ogilvie-Grant Brown-chested Alethe F.
Another abundant thrush and our collectors obtained 16 examples. The species was reported by Jackson (994) and by the K.M. Expedition (36). Our series contains birds with small and enlarged gonads, taken in April, May and June; stomach contents ants, beetles and other insect fragments, and very small snails.

Erithacus erythrothorax xanthogaster (Sharpe) Forest Robin F.
Abundant; our field teams obtained 18 examples and many others were released. Reported by Jackson (1088) and the K.M. Expedition (36). Most of our specimens, April to June, had enlarged gonads; stomach contents ants, small beetles and other insect fragments.

Cossypha natalensis intensa Mearns Red-capped Robin Chat F.
Fist collected by the K.M. Expedition (36). In May 1970 our collectors obtained two birds with much enlarged gonads; stomach contents insect remains.

Cossypha cyanocampter bartteloti Shelley Blue-shouldered Robin Chat F
Common; noted by van Someren (239), Jackson (986), the K.M. Expedition (36), and by our collectors. None of our few specimens, collected in April, May and June, was in breeding condition; stomach contents insect fragments.

Cossypha niveicapilla melanonota (Cabanis) Snowy-headed Robin Chat F.
More numerous than the preceding species, this robin chat is represented in our collection by eight specimens, April to June, some with large and some with small gonads; stomach contents insect fragments. Reported by van Someren (240).

Neocossyphus rufus gabunensis Neumann Red-tailed Ant-Thrush F.
First reported by Chapin (1953:564); a single specimen was collected by the K.M. Expedition (37). Our collectors obtained 10 examples in April, May and June, some with small and others with enlarged gonads; stomach contents ants and other insect fragments and a small millipede.

Neocossyphus poensis praepectoralis Jackson White-tailed Ant-Thrush *F.
First recorded by our collectors who procured 6 specimens, 22nd April to 27th June, all but one with some gonadal enlargement; stomach contents ants and other insect remains.

Stizorhina fraseri vulpina Reichenow Rufous Flycatcher F.
Common; the first record was by the K.M. Expedition (37). Our teams procured 15 specimens, 17th April to 8th July, including one juvenile, some adults with enlarged gonads and some with small; stomach contents fragments of beetles and other insects.

Turdus olivaceus centralis Reichenow Olive Thrush F.
Reported by van Someren (238), Jackson (949) and the K.M. Expedition (38). On 19th June 1966, our collectors obtained a single breeding female.

Turdus princei batesi (Sharpe) Grey Ground-Thrush F.
First reported by the K.M. Expedition (37). At that time this was only the second record of this species from Uganda, the earlier one being from Bugoma. In 1966 our collectors obtained two non-breeding specimens, on 24th June and 5th July respectively; stomach contents snails, beetles and other insect fragments.

Sphenoeacus mentalis mentalis (Fraser) Moustache Warbler
Only recorded by the K.M. Expedition (41).

Phylloscopus budongoensis (Seth-Smith) Uganda Woodland Warbler F.
Originally described on the basis of two specimens taken in the Budongo Forest in February and May 1907, by L.M. Seth-Smith. Van Someren (97), Jackson (1037) and Chapin (1953;474) list the forest as a locality for it. Our collectors obtained a single male in non-breeding state, on 8th May 1970; stomach contents insect fragments.

Cisticola erythrops sylvia Reichenow Red-faced Cisticola
Reported by van Someren (218) and Jackson (1109). On 28th May 1970, our collectors obtained one male, testes enlarged; stomach contents insect fragments. This species lives in the open country outside the forest.

Cisticola woosnami woosnami Ogilvie-Grant Trilling Cisticola
Listed by van Someren (217) and Jackson (1103).

Cisticola lateralis antinorii (Heuglin) Whistling Cisticola *
The only record known to us from the Budongo area, not from the forest itself, is a male, testes much enlarged, taken by our collectors on 19th April 1970; stomach contents small beetles and fragments of a grasshopper.

Prinia leucopogon reichenowi (Hartlaub) White-chinned Prinia F.
Reported by all workers; our collectors procured a breeding female on 24th June 1966, and another non-breeding female on 18th May 1970.

Apalis nigriceps collaris van Someren Black-capped Apalis F.
Fairly common; our collectors obtained 9 specimens in May 1970, some with enlarged gonads and some with small ones; stomach contents insect fragments. The species has been reported only by the K.M. Expedition (39).

Apalis jacksoni jacksoni Sharpe Black-throated Apalis F.
Less numerous than the preceding species. Our collectors obtained one example on 22nd May 1970, a female with a small ovary; stomach contents insect fragments. The K.M. Expedition (39) procured two immature specimens.

Apalis rufogularis nigrescens (Jackson) Black-backed Apalis F.
Common; it is recorded by most of the earlier authors and our collectors obtained 11 specimens, 7th-28th May 1970; some with enlarged gonads, others with small ones; stomach contents black beetles, lepidopteran eggs and insect fragments.

Eminia lepida Hartlaub Grey-capped Warbler F.
Only recorded by van Someren (228).

Camaroptera superciliaris (Fraser) Yellow-browed Camaroptera F.
Fairly common, our collectors obtained 4 specimens, 19th April to 22nd May 1970; all in non-breeding state; stomach contents insect fragments. Recorded by van Someren (227) and Jackson (1087).

Camaroptera chloronota toroensis (Jackson) Olive-green Camaroptera F.
Abundant; reported by all previous authors, our collectors obtained 18 specimens in April, May and June. One female, taken 14th June 1966 was a breeding bird; some of the other examples had large, others small, gonads; stomach contents various insect fragments, including small black beetles and lepidopteran eggs.

Camaroptera brachyura brevicaudata (Cretzschmar) Grey-backed Camaroptera F.
Common; recorded by van Someren (228), the K.M. Expedition (40), and by our collectors in 1970, who procured 8 specimens in April and May, two with enlarged, the rest with small, gonads; stomach contents small insect fragments.

Eremomela badiceps badiceps (Fraser) Brown-crowned Eremomela F.
Recorded by the K.M. Expedition (40). In 1970 our collectors obtained two specimens, 10th and 12th May, a male with large testes, and a female with a small ovary; stomach contents insect fragments.

Sylvietta virens baraka Sharpe Green Crombec F.
Fairly common; six specimens were taken, 20th April to 5th May, all in non-breeding state; stomach contents insect fragments. This species was reported by the K.M. Expedition (40).

Macrosphenus concolor (Hartlaub) Grey Longbill F.
This species has only been noted by Jackson (847). Chapin (1953: 244) mentioned Budongo, (possibly the same record), along with Bugoma and Mabira Forests, as the Uganda localities comprising the eastern limits of the bird's range.

Macrosphenus flavicans hypochondriacus (Reichenow) Yellow Longbill F.
Most of the earlier expeditions mentioned this species; our collectors obtained 6 specimens in April and May, some with considerable gonadal swelling; stomach contents insect fragments.

Hylia prasina prasina (Cassin) Green Hylia F.
Reported by van Someren (229); found by our collectors to be very common and they obtained 19 examples in April, May and June; stomach contents insect fragments.

Dicrurus adsimilis coracinus Verreaux Velvet-mantled Drongo
Included on the basis of records by van Someren (125) and Jackson (1171).

Prionops plumata concinnata Sundevall Curly-crested Helmet Shrike
Not a forest bird, it was collected at the edge of the Budongo by the K.M. Expedition (43).

Tchagra minuta minuta (Hartlaub) Blackcap Bush Shrike
Our collectors obtained one male of this non-forest species, testes not enlarged, 13th May 1970. Previously the species had been taken in the area only by the K.M. Expedition (43).

Tchagra australis emini (Reichenow) Brown-headed Bush Shrike
Reported by van Someren (110); not a forest bird, it must have been taken in the surrounding bush country.

Laniarius ferrugineus major (Hartlaub) Tropical Boubou Shrike
Recorded by van Someren (117) from the Budongo area, not from the true forest.

Lanius mackinnoni Sharpe Mackinnon's Shrike *
We have one specimen, a female with a large ovary, taken 14th May 1970, at the forest edge; stomach contents grasshoppers. This shrike is a bird of the forest edge and of more open country.

Lanius collaris smithii (Fraser) Fiscal Shrike
Recorded by van Someren (122); it must have been from the open country immediately outside the forest.

Parus leucomelas guineensis Shelley Black Tit
Recorded by the K.M. Expedition (44); it is a bird of parklands, not of the forest.

Parus funereus funereus (J. & E. Verreaux) Dusky Tit F.
Recorded by the K.M. Expedition (44) and by our collectors, who took two males, 9th and 16th May 1970, both with enlarged testes; stomach contents insect remains.

Oriolus brachyrhynchus laetior Sharpe Western Black-headed Oriole F.
Common; our collectors obtained 7 specimens in May 1970; some with large gonads and others with small ones; stomach contents beetles, caterpillars and other insect fragments, and, in one case, some fruit (?) pulp. Recorded by van Someren (127) and the K.M. Expedition (45).

Oriolus larvatus rolleti Salvadori Black-headed Oriole
A bird of the forest edge and of tree-dotted open country, it was reported by van Someren (127) and the K.M. Expedition (45).

Onychognathus fulgidus hartlaubii Gray Chestnut-wing Starling *F.
Our collectors obtained one example of each sex, 19th and 21st May 1970; the male with small testes, the female with the ovary enlarged; stomach contents fruit of the Temera tree and one large grub.

Lamprotornis purpureiceps (J. & E. Verreaux) Purple-headed Glossy Starling F.
Common; recorded by all the collectors reported in the literature. Our field team obtained three specimens 11th to 22nd May 1970, two with large, one with small, gonads: stomach contents fruit and fruit seeds.

Lamprotornis purpureus amethystinus (Heuglin) Purple Glossy Starling *
This species inhabits the open grasslands outside the forest. One example, labelled as "Budongo Forest", now in the collection of the Western Foundation of Vertebrate Zoology, is the only local record known to us.

Lamprotornis chalcurus emini (Neumann) Bronze-tailed Starling
First reported by the K. M. Expedition (45); on 30th May 1970, our collectors took a non-breeding male; stomach contents insects. This bird lives in the bushy grasslands near the forest.

Lamprotornis splendidus splendidus (Vieillot) Splendid Glossy Starling F.
Reported by all collectors. In May 1970, our collectors obtained four specimens, three males with enlarged testes and one female with a small ovary; stomach contents fruit remains, one hard kernel, one small insect.

Lamprotornis purpuropterus purpuropterus Rüppel Rüppell's Longtailed Glossy Starling
Listed by van Someren (131). It is a bird of open wooded country, not of the true forest.

Cinnyricinclus leucogaster leucogaster (Boddaert) Violet-backed Starling
Reported by the K.M. Expedition (46). It is a bird of the open tree and bush country, not of the forest.

Zosterops senegalensis stuhlmanni Reichenow Green White-eye
Recorded by van Someren (192), and a single example, in non-breeding state, was obtained by our collectors on 14th May 1970; stomach contents vegetable matter. This species does not penetrate into the forest, but occurs at the edges and in the tree-dotted parklands outside it.

Anthreptes fraseri axillaris (Reichenow) Grey-headed Sunbird F.
Common; it has been reported by all earlier authors. We have six specimens in non-breeding state, taken in April and May 1970; stomach contents ant pupae and other insect fragments.

Anthreptes longuemarei haussarum Neumann Uganda Violet-backed Sunbird
Reported by van Someren (201), probably from outside the forest as it is not a sylvan species. The junior author has found it to be not uncommon in the wooded savannas west of the forest.

Anthreptes rectirostris tephrolaema (Jardine & Fraser) Green Sunbird F.
Our collectors obtained a non-breeding female on 22nd May 1970; stomach contents small berries.

Anthreptes collaris garguensis Mearns Collared Sunbird F.
Common, chiefly in the secondary growth and around the clearings. It was reported by most of the earlier authors. In April and May 1970, our collectors obtained five examples, one of which had enlarged gonads; stomach contents ant pupae and other insect fragments and a single fruit seed.

Nectarinia seimundi traylori Wolters Little Green Sunbird F.
Chapin (1954:205) was the first author to list this sunbird. The K.M. Expedition (48) collected it there and in 1970 our collectors took four examples, 16th April to 28th May, all in non-breeding condition; stomach contents insect fragments.

Nectarinia olivacea ragazzii (Salvadori) Olive Sunbird F.
Very common: we have 24 specimens, April, May, June and July, a few with gonadal enlargement, but the majority with little or no seasonal swelling; stomach contents small black beetles, insect larvae and other insect fragments. Recorded by van Someren (200) and the K.M. Expedition (47).

Nectarinia verticalis viridisplendens (Reichenow) Green-headed Sunbird F.
Common; our collectors obtained five specimens in May 1970, one with enlarged, the others with small gonads; stomach contents insect fragments. Reported by van Someren (200) and the K.M. Expedition (47).

Nectarinia cyanolaema octaviae (Amadon) Blue-throated Brown Sunbird F.
First recorded by the K.M. Expedition. Our collectors obtained a non-breeding female on 21st May 1970.

Nectarinia rubescens rubescens (Vieillot) Green-throated Sunbird F.
Collected by the K. M. Expedition (47); and two were procured by our collectors in May 1970; both in non-breeding state.

Nectarinia senegalensis lamperti (Reichenow) Scarlet-chested Sunbird
Collected by van Someren (199) and the K.M. Expedition (47). In May 1970, our collectors obtained two specimens, both with small gonads; stomach contents insect remains, including one caterpillar. This is a bird of the tree-dotted grasslands.

Nectarinia venusta igneiventris (Reichenow) Variable Sunbird
Recorded by van Someren (198), this sunbird does not penetrate far into the forest, but frequents the more open country immediately outside it.

Nectarinia chloropygia orphogaster (Reichenow) Olive-bellied Sunbird F.
One of the most abundant sunbirds in the forest where it was found by earlier expeditions as well as by our collectors, who obtained 17 specimens, April, May and June 1966 and 1970. All our examples had little or no gonadal enlargement; stomach contents small insect fragments.

Nectarinia cuprea cuprea (Shaw) Copper Sunbird

Not a bird of the deep forest, but of the open country surrounding it and open glades within it. Reported by van Someren (197), and found there again in May 1970 when our collectors took 6 examples, all with small gonads; stomach contents insect fragments.

Nectarinia superba buvuma (van Someren) Superb Sunbird

Fairly common; represented in our collection by 7 specimens, May 1970 and June 1966; one female was breeding on 5th May; stomach contents insect fragments, spiders, and some substance that was tentatively identified as nectar by the collector. This sunbird is much attracted to banana flowers in cultivated areas at the forest edge.

Nectarinia kilimensis kilimensis Shelley Bronze Sunbird

Primarily a bird of the highlands, but van Someren (192) recorded it from Budongo.

Passer griseus griseus (Vieillot) Grey-headed Sparrow

Found in open clearings inside or adjacent to the Forest by the K.M. Expedition (49).

Amblyospiza albifrons melanota (Heuglin) Grosbeak Weaver

Not a forest bird, it inhabits the tall grass in the clearings around the dense woodlands. Recorded by van Someren (144) and the K.M. Expedition (49). Our collectors procured four specimens there in April and May 1970, one with enlarged the others with small, gonads; stomach contents insect fragments and small fruits.

Ploceus baglafecht emini (Hartlaub) Emin's Weaver F.

Two non-breeding females were collected on 10th and 11th May 1970; stomach contents insect fragments. This weaver was collected by the K.M. Expedition (49) and van Someren (138).

Ploceus ocularis crocatus (Hartlaub) Spectacled Weaver

Does not occur in the true forest, but in the tree-dotted parklands surrounding it. Our collectors obtained two adults; a breeding female, 15th June, and a single non-breeding male, 28th May 1970; stomach contents insect fragments. This weaver was reported by van Someren (139).

Ploceus nigricollis nigricollis (Vieillot) Black-necked Weaver F.

Reported by van Someren (139) and the K.M. Expedition (49). In April and May 1970, our collectors obtained three specimens, two with small, one with enlarged, gonads; stomach contents insect fragments.

Ploceus xanthops (Hartlaub) Holub's Golden Weaver

Recorded only by van Someren (141). This weaver is a bird of the high grass and bush country outside the forest.

Ploceus cucullatus bohndorffi Reichenow Black-headed Weaver

Known only on the basis of van Someren's record (141).

Ploceus nigerrimus nigerrimus Vieillot Vieillot's Black Weaver F.

Very common; recorded by van Someren (143), the K. M. Expedition (50) and our collectors in 1966 and 1970. We have 11 specimens, mostly with enlarged gonads, but some with small ones, all taken in late April and early May; stomach contents seeds and insect fragments.

Ploceus melanocephalus fischeri Reichenow Yellow-backed Weaver F.

Common; our collectors obtained 11 specimens, 4th-14th May 1970; some with small and others with enlarged gonads; stomach contents insect fragments, seeds and grit. This species had previously been found by the K.M. Expedition (50).

Ploceus tricolor interscapularis Reichenow Yellow-mantled Weaver F.

Van Someren (144) alone reports this weaver.

Ploceus superciliosus (Shelley) Compact Weaver

A bird of the moist grasslands, it does not enter the forest. Our collectors procured a non-breeding male on 28th May; stomach contents insect fragments. The species had been collected by van Someren (144) and the K.M. Expedition (50).

Malimbus rubricollis rubricollis (Swainson) Red-headed Malimbe F.

Common; we have 5 specimens taken in May 1970, some with and some without gonadal enlargement; stomach contents insect fragments and grit. This weaver has been reported by all previous writers.

Malimbus malimbicus malimbicus (Daudin) Crested Malimbe F.

Abundant and all previous authors reported it. Our collectors procured 14 examples in June and July 1966, and April and May 1970; some with large gonads, and others with small ones; stomach contents ant pupae, other insect fragments, fruit and seeds, but chiefly insect material. On 18th April, Williams found a nest and eggs of this species.

Quelea erythrops (Hartlaub) Red-headed Quelea *

A bird of the open bush country outside the forest, where five examples were secured 4th to 6th May 1970; some with small and some with large gonads; stomach contents white seeds and grit.

Euplectes gierowii ansorgei (Hartert) Black Bishop

A species of the grass and bush country outside the forest; first reported by the K.M. Expedition (51); a male with somewhat enlarged testes was collected by our field team on 19th June 1966; stomach contents seeds and some green vegetable matter.

Euplectes ardens concolor (Cassin) Red-collared Widow Bird

In the area around Budongo Forest two races of this widow bird meet, *concolor*, which has no red, and typical *ardens*, which has a well marked red collar. Examples of both were collected by the K.M. Expedition (51). On 28th May, 1970, our collectors took a single further example, of *concolor*, a male with enlarged testes; stomach contents small seeds.

Vidua macroura (Pallas) Pin-tailed Whydah

Found outside the Budongo Forest by the K.M. Expedition (52) and by our collectors on 13th and 14th May 1970, when two females, including one in full breeding state were taken; stomach contents seed fragments and grit.

Parmoptila woodhousei jamesoni (Shelley) Red-fronted Ant-pecker * F.

First recorded by our team who collected a male in non-breeding state on 9th May 1970; stomach contents fine insect fragments. The species is known from several other west Ugandan forests—the Bwamba, Kibale, Kalinzu, and Impenetrable. Our single male differs from 7 others from the other forests in having the forehead cinnamon rufous instead of dragon's blood red (Ridgway colour terms). Additional Budongo material would be interesting to examine.

Nigrita fusconota fusconota Fraser White-breasted Negro Finch F.

Found only by the K.M. Expedition (52).

Nigrita canicapilla schistacea Sharpe Grey-headed Negro Finch F.

Common; our collectors procured 8 specimens in May 1970, some with, and others without, gonadal enlargement; stomach contents small seeds, and, in one case, some ant pupae. This species was recorded by van Someren (157) and the K.M. Expedition (51). Traylor (1968:310) calls the Uganda population of this species *sparsimguttata*, but we have not been able to recognise that form as distinct.

Mandingoa nitidula schlegeli (Sharpe) Green-backed Twin-spot F.

Encountered by our collectors both in June and July 1966, and in April and May 1970, and 11 specimens were preserved. One of these, a female, taken 30th April, was breeding; another, 3rd May was a juvenile; the rest of the series included birds with and without gonadal swellings; stomach contents seeds and grit. The species was found by the K.M. Expedition (52).

Pyrenestes ostrinus ostrinus (Vieillot) Lesser Seed-cracker * F.

Very common, where it seems to have eluded earlier collectors. Our field teams met with it in June-July 1966, and again in April-May 1970, and trapped great numbers in their mist nets. Most of these were then released, but a series of 36 specimens were saved because of the great variation in the bill size. Even with this fine series, and with much comparative material from other Ugandan forests, we find it impossible to divide the birds into meaningful taxa. Such a division necessitates proof that birds mate only with others of similar bill size, which is not yet known. Two of our examples, taken 23rd June and 4th July were marked as breeding; others showed great variation in gonadal size, from small to large, on the same dates; stomach contents seeds, crushed berries and grit.

Spermophaga ruficapilla ruficapilla (Shelley) Red-headed Bluebill F.

Abundant, recorded by all earlier collectors as well as by our 1966 and 1970 teams. We have 31 specimens, which represent but a fraction of all those caught in the mist nets. Of these, some taken in May, June and July were marked as breeding, while others taken in the same months had small resting gonads; stomach contents mostly seeds, some insect fragments in a few cases, and grit.

Clytospiza monteiri (Hartlaub) Brown Twin-spot * F.

First recorded by our collectors in June 1966, and again in May 1970. We have 11 specimens, with varying degrees of gonadal swelling; stomach contents small seeds and grit.

Lagonosticta senegala ruberrima Reichenow Red-billed Fire-Finch

Recorded from Budongo Forest edge only by the K.M. Expedition (52)

Lagonosticta rubricata ugandae Salvadori African Fire-Finch

Recorded by van Someren (158) and Jackson (1507). It is not a forest bird, but a denizen of the bush country outside it. Its presence is a little suprising as the species is found usually at higher elevations.

Estrilda paludicola roseicrissa Reichenow — Fawn-breasted Waxbill *

This waxbill is found in the open bush country, and was encountered there by our collectors on 4th July 1966, and again on 20th May 1970, on each of which days a single male was obtained; one of these an adult, with enlarged testes, 20th May; stomach contents small seeds.

Estrilda astrild adesma Reichenow — Waxbill *

Another open country species, this waxbill is represented by one male, testes small, taken 13th May 1970.

Estrilda nonnula nonnula Hartlaub — Black-crowned Waxbill F.

A common bird and our collectors preserved 11 examples out of a great number caught in their mist nets, 19th April to 27th May 1970; some had small, others, enlarged gonads; stomach contents small seeds and grit.

Lonchura cucullata cucullata (Swainson) — Bronze Mannikin

First recorded by the K.M. Expedition (51), and again by our collectors on 7th July 1966, when they took two specimens, including one in full breeding condition; stomach contents small seeds, Our collectors reported the species common in the open glades of the forest.

Lonchura bicolor poensis (Fraser) — Black and White Mannikin

Encountered in the more open areas by our collectors in May 1970, when they preserved four specimens out of a larger number taken in their mist nets; all in non-breeding state; stomach contents small seeds. The K.M. Expedition (51) also found this species.

Serinus frontalis frontalis Reichenow — African Citril *

Occurs in grasslands and it must have been in some such place outside the Budongo Forest that our collectors procured two males, 19th and 27th May 1970, both with testes enlarged; stomach contents small seeds and grit.

Serinus mozambicus barbatus (Heuglin) — Yellow-fronted Canary *

The status of this canary in the Budongo area is similar to that of *S. frontalis.* We have two specimens, taken 6th and 27th May 1970, one with enlarged testes; stomach contents small seeds and grit.

Serinus sulphuratus shelleyi Neumann — Brimstone Canary

Recorded by van Someren (171); the K.M. Expedition (53) found it at the edge of the forest; our collectors procured a single male with enlarged gonads on 6th May 1970; stomach contents seeds.

Emberiza cabanisi cabanisi (Reichenow) — Cabanis' Bunting

Listed by van Someren (173) and Jackson (1554), this bunting must have been found outside the true forest. Williams noted it, infrequently, in the savanna woodlands west of the Forest.

Emberiza forbesi forbesi Hartlaub — Brown-rumped Bunting

The only record is from the Budongo Escarpment, not the forest itself (K.M. Expedition (153).

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VEGETATION OF RUSINGA ISLAND

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Rusinga Island is an island in Lake Victoria. It is situated in the South Nyanza district of Kenya. It is only just divided from the mainland by a narrow channel about 100 m across, but this has been sufficient to produce noticeable differences between it and the mainland in vegetation. The island is well populated, the people living for the most part on the flats along the lake shore and on the lower slopes of the hills. There is some evidence that it has been inhabited for a considerable period of time, with far reaching effects on the vegetation. The main interest in examining its present vegetation is to try and deduce from this what the natural, i.e. primary, vegetation succession was before disturbance by man.

TOPOGRAPHY AND GEOLOGY

Rusinga Island consists of a number of hills, the tallest of which, Lugongo Hill, is approximately 300 m above lake level. The lake itself is 1134 m above sea level. The hills are composed of volcanic sediments and agglomerates dating from the Early Miocene. Radiometric dates give a range of ages of deposition from over 20 to 16 million years B.P. (Van Couvering & Miller, 1969). These deposits are part of a large volcano, which is centred at Rangwa Hill on the mainland and from which also came the agglomeratic hills of Gwasi and Gembe and the deposits on the Uyoma peninsula of Central Nyanza (see Fig. 1). The highly alkaline nature of these deposits was very beneficial to fossil preservation during the time of deposition, and must have had a profound effect on local vegetation. At present the only immediately obvious effect of this alkalinity is on the central plug of the volcano itself: Rangwa Hill.

In the Early Miocene, before uplift and rifting of the East African plateau had proceeded very far, the area covered by Lake Victoria at present was a westerly tilted plain with rivers flowing towards the Atlantic. The date of first formation of the lake is not known, but is thought to be 40,000–50,000 years B.P. There are several lake terraces known around the lake. These represent former levels of the lake, but only the 15 m terrace can be seen on Rusinga Island. The terraces were probably formed as a result of irregularities in the rate of downcutting of the Nile, but changes in climate may also have been important. For instance, increased rain and lower temperatures since 1960 have resulted in a 3 m rise in lake level over a period of only two years (Kendall 1969).

CLIMATE

The climate around Lake Victoria is strongly influenced by the lake. A permanent low pressure zone produces heavy rain over the lake and along its shores, particularly

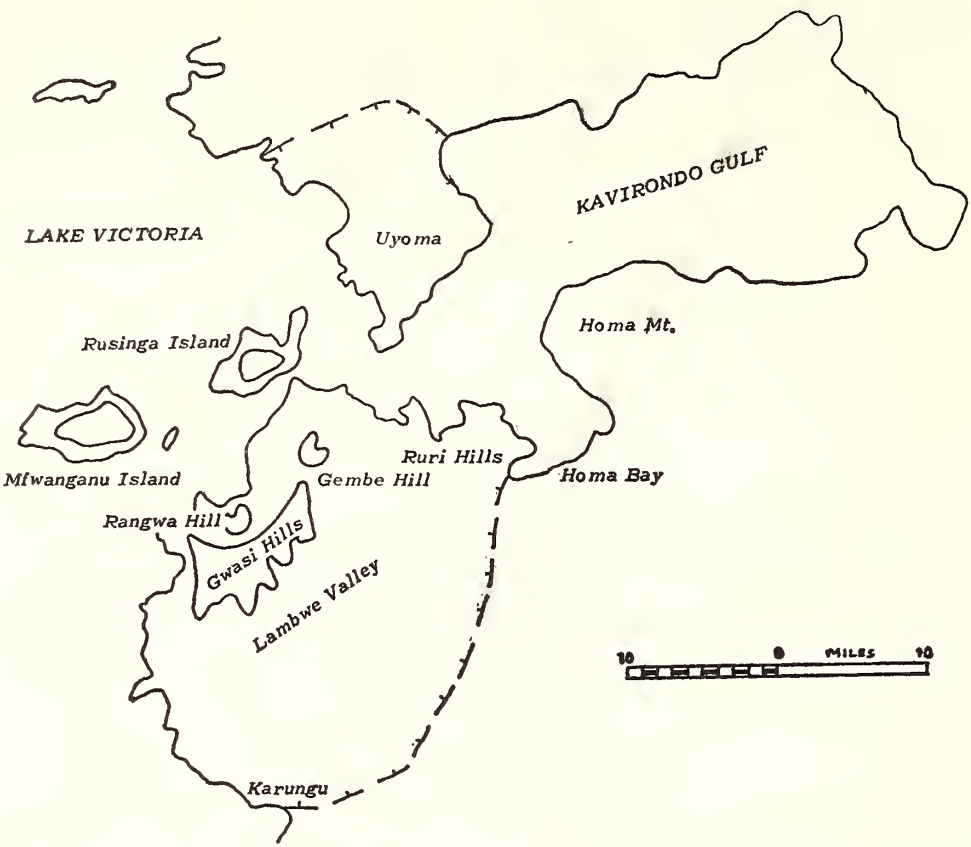

Fig. 1 Locality map showing positions of Rusinga Island and the other places referred to in the text. The broken line shows the extent of the Miocene Volcanic deposits centered around Rangwa Hill.

in the north and west since the predominant winds are from the south and east (Kendal 1969). The rainfall along the Kenya shore of the lake varies from 800 to 1300 mm, increasing north eastwards up the Kavirondo Gulf, and is fairly well spread throughout the year. At Kisumu, the month with the least amount of rain (January) still has an average of 7 days rain (figures published by the East African Meteorological Department). The amount of rain apparently decreases further from the lake if there is no significant rise in altitude, but where altitude does increase there is an increase in rainfall.

Trapnell & Griffiths (1960) have discussed the relation of rainfall and altitude with reference to ecology. They conclude that the low-lying areas around the lake are at the end of an altitudinal and ecological sequence extending from moist montane forest to what they call intermediate semi-evergreen thicket around the lake. This sequence can be seen within the limits of local influence of the lake up the slopes of the Gwasi Hills, which rise from the lake shore to a height of over 2000 m, and have montane evergreen forest at the top. This forest is dominated by *Catha edulis* Forsk., which is the dominant species also in the Chyulu Hills (Faden, pers. comm.), but from local accounts the forest was once much richer and more extensive, and at one time provided large timber for local canoe manufacture.

HISTORY OF VEGETATION CHANGES

There is a little information on prehistorical vegetation in the Lake Victoria region. On Rusinga Island itself an 18 million year old Miocene flora was described by Chesters (1957) on the basis of fossil seeds and endocarps. She described 17 families with 21 genera, from which 12 species, which have closely allied living counterparts, are either climbers (5), large forest trees (3), or smaller forest trees (4). The most characteristic families are Annonaceae, Apocynaceae, Euphorbiaceae, Menispermaceae, Rhamnaceae and Ulmaceae. In addition to these, in the Miocene deposits of the neighbouring island of Mfwanganu there is an abundance of *Entandrophragma* sp. The single species of the Apocynaceae, *Leakeyia vesiculosa* Chesters, had endocarps with air floats, indicating fruit dispersal by water. The abundance of trees and climbers in the flora, and the affinities of the species, was taken to indicate evergreen forest conditions in the Miocene, perhaps gallery forest bordering water (Chesters 1957).

Since the Miocene major geological events have drastically altered the landscape in the Kavirondo area (Baker & Wohlenberg 1971). During the Pleistocene there were changes in climate that must have radically altered ecological conditions (Moreau 1952, Carcasson 1964). Of all this time nothing can be said, but an attempt can be made to assess the human impact in historical times.

The earliest evidence of human occupation of Rusinga Island is the presence of stone tools of the Sangoan culture on the lake terrace mentioned above. In the same deposit are abundant bovid remains which suggests that at the time of deposition of the terrace the vegetation consisted of a fairly open type of woodland, perhaps similar to the present day. From this time (very approximately 30,000–50,000 years B.P.) until only 1000 years B.P. there is another gap, after which there is evidence of iron age occupation in parts of Nyanza, although not for Rusinga Island (Leakey *et al* 1948). These people, having the use of iron and fire, probably had considerable impact on their environment. Within the last few hundred years the shoreline of South Nyanza was settled first by Bantu people and subsequently by Luo (Ogot 1967). The historical traditions of the Bantu are poorly preserved as they were assimilated by the Luo invaders, and the present day inhabitants of Rusinga Island all speak Dholuo and follow Luo customs.

What effect the early stone age cultures had on the environment it is difficult to say, but it seems likely that those based on a hunting economy had little effect. In his detailed record of changes in vegetation during the last 15,000 years, Kendall (1969, p. 162) found a great increase in grass pollen on the north shore of Lake Victoria about 2000 years ago. He interprets this as being due to the arrival of agricultural—though still stone age—man. Fire was probably their principal weapon against the forest, for stone tools make laborious work of cutting down a tree. Whether Rusinga Island was inhabited at this time is not known, but the probable occupation of the island for at least the last 100 years by iron age cultures before the arrival of the Luos cannot have been without effect on the vegetation.

PRESENT VEGETATION

There are a number of plant communities to be recognized on Rusinga Island. These depend partly on soil and physiographic factors but also in places on cultural factors, and the two may produce a similar end result. Thus the usual lake shore vegetation consists of scattered trees up to 15 m tall of *Balanites aegyptiaca*, *Acacia seyal*, and *Euphorbia candelabrum* (see Table 1 for authorities); but in the "gumbas", which are sacred places in the Luo culture and where people are prohibited from burning, there is an almost luxuriant woodland of figs (*Ficus capensis*), *Albizia coriaria*, and large trees of the species mentioned above. In the lower regions of river valleys, where gullying is not too active, exactly the same association occurs, although never as thick nor as high and not usually with the same luxuriance of ground vegetation because of grazing. Higher up the hillsides the plant associations are rather different, due mainly to shallow

soils and steep slopes. The characteristic species are *Acacia seyal*, *Sapium ellipticum*, *Commiphora* sp., and *Rhus natalensis*. Heights are lower than the lake shore trees, ranging from 4–12 m. Areas of land that are lying fallow at present but which were evidently cultivated or cleared up to a few years ago have a dense scrubby association of *Acacia*, *Tamarindus*, and *Euphorbia*. Conspicuous for its absence on Rusinga Island is any member of the family Combretaceae.

LAKE SHORE COMMUNITIES

The lake shore is extensively cultivated now and offers some of the flattest and most fertile land on the island. In places where it is cut by river courses or where there is a "gumba" the tree growth becomes very dense, but usually there are just scattered trees of the following species: *Acacia brevispica*, *A. seyal*, *Albizia coriaria*, *A. zygia*, *Balanites aegyptiaca*, *Canthium schimperanum*, *Cordia ovalis*, *Euphorbia candelabrum*, *E. tirucalli*, *Ficus capensis*, *F. sycomorus*, *Haplocaelum foliolosum*, *Maytenus senegalensis*, *Pseudospondias microcarpa*, *Scutia myrtina*, *Stereospermum kunthianum* and *Tamarindus indica*. Common grasses are *Hyparrhenia rufa*, *Sporobolus agrostoides* and *Themeda triandra*.

The same species occur more thickly in the less disturbed areas along the lake shore, and it appears both from their distribution and from local report that neither fire nor wildlife grazing has had any appreciable effect on the area. It has simply been a matter of clearing the natural vegetation by the local inhabitants. However, there appears to be no part of this community that has not been cleared at some time in the not too distant past. Even the "gumbas", which in any case are only 1–2 ha in extent, were probably cleared some time prior to the Luo settlement over 100 years ago. Many of the large isolated trees along the lake shore show signs of having grown in closed forest conditions, i.e. they have a straight bole without any branches for 3–6 m and a fairly constricted crown.

A variation of the lake shore community is that of *Acacia drepanolobium* on black cotton soil. This is uncommon on the island, drainage on the whole being good. It occurs over large parts of Lambwe Valley, the floor of which is exceedingly flat, but in the better drained parts of the valley floor the species comprising the tree thickets have some differences from Rusinga Island, although *Acacia seyal* is dominant in many places. Similar species associations to the Rusinga lake shore are seen in the dry valleys running into Lambwe valley from the Gwasi Hills, and the Kaniamwia Escarpment.

One further variation that must be mentioned is the swampland along the lake shore. This occurs patchily along the shore and is nowhere extensive. It is dominated by *Cyperus papyrus* L.

HILLSIDE COMMUNITIES

The vegetation on the hillsides is surprisingly independent of either degree of slope or geological horizon. The Pleistocene terrace has the same vegetation association as the higher Miocene volcanics of Lugongo Hill, but the vegetation of the latter is strikingly different from that of Gembe Hill on the neighbouring mainland, even though they are part of the same geological horizon. The explanation of this would seem to be that Gembe Hill is regularly burnt over as an aid to hunting and to improve grazing, so that trees are scattered on the exposed slopes and consist largely of *Combretum*, *Acacia* and *Commiphora* species. In a few sheltered gullies on the west slopes of Gembe Hill the vegetation is much thicker and more like that of Rusinga Island. On Rangwa Hill and on the other two carbonatite hills in South Nyanza, Ruri Hills and Homa Mountain, the dominant tree species is *Terminalia brownii* Fres. associated with *Combretum molle* G. Don. The latter is widespread in South Nyanza, but the former occurs only on these three hills in the whole of the western part of this district.

Typical species represented on the slopes of Rusinga Island are as follows: *Acacia brevispica*, *A. hockii*, *A. seyal*, *Annona senegalensis*, *Carissa edulis*, *Commiphora* sp., *Euphorbia* spp., *Ficus* spp., *Grewia mollis*, *Kigelia africana*, *Lannea stuhlmannii*, *Maytenus senegalensis*, *Pseudospondias microcarpa*, *Rhus natalensis*, *Sapium ellipticum*, *Stereospermum kunthianum*, *Ximenia americana* and *Ziziphus mucronata*. In addition, *Markhamia platycalyx* is present in several places, but according to the local people it has been introduced artificially there.

There are great variations in the density of tree species on the hillsides of Rusinga Island. The north and west slopes of Lugongo Hill appear to have deeper soil and to have been cultivated more in the past, and here the tree cover is more sparse; whereas in places on the south and east slopes, where the soil is very thin, dense thickets are common, interspersed with grass glades where the soil is almost non-existent. Gullying occurs all round the slopes of the hills on the island, cutting down deeply into the Miocene sediments, and while some of these are now overgrown with trees others are completely barren, especially those in areas of intensive agricultural activity at present.

DISCUSSION

The vegetation type present in an area today is not usually a reliable indication of what would be there in the absence of human interference. Glover (1968) considers that "fire, shifting cultivation and grazing are the major factors responsible for the formation and maintenance of savanna country". Nonhuman factors may be concentration of elephant or hippopotamus populations and naturally occurring fire. Savanna communities are therefore deflected sub-climax associations dependent on these factors for their maintenance and the implication is that in the absence of these factors they would revert in whole or in part to woodland communities. Similarly, Pratt, Greenway & Gwynne (1966) state unequivocally that "most East African vegetation types are the product of human activity". They go on to suggest a system of classifying vegetation types based on the density and height of tree or bush canopy cover, and their system is used in this paper.

The existence of large expanses of open grassland in East Africa at the present time has led to the belief that it is a natural climax. The same is true of the even larger expanses of so-called savanna. The classification of Pratt, Greenway & Gwynne (1966) accepts this implicitly, merely changing the vague term savanna to more precise terms such as wooded grassland etc. In his analysis of tropical African grasslands, Michelmore (1939) came to the conclusion that grassland is very limited under natural conditions and that:

(1) grass is favoured by strong seasonality of rainfall.

(2) within the equatorial zone, which as a whole does not have a long dry season, grass is limited to areas where either the soil is extremely thin, e.g. glades within an area of evergreen forest, or the soil is waterlogged for part of the year, e.g. flood plains, valley bottoms, and on black cotton soils.

There are two exceptions to this generalization: montane grassland that develops above the tree line, and desert grasslands where absolute rainfall is extremely limited. Apart from these, however, grassland as a natural climax is rare in equatorial Africa, and where it is present as a result of human activity it is in general less luxuriant than further north and south away from the equator (Michelmore 1939).

The present vegetation on Rusinga Island varies from grassland to woodland. It has been shown to have been inhabited by people for a considerable period of time, and the most important factors that would appear to have modified the vegetation are probably shifting cultivation and grazing. Goats, sheep and cows are grazed all over the island. There are permanent farms on the lower slopes of the hills and along the lake shore, but shifting cultivation is still practised on the upper slopes, cultivated land there only retaining the soil for a few seasons. Deep gullies at present stabilized with tree thickets are evidence of former clearing of land now under woodland vegetation.

In addition to these human factors, hippos exert a local influence along the lake shore.

It can be concluded that the vegetation of Rusinga Island has been much disturbed by human settlement, both past and present; and in this it is no exception to the general conclusion mentioned earlier that human interference has greatly altered tropical African vegetation communities. An attempt will now be made to say what the vegetation type of Rusinga Island would be if it were undisturbed.

To begin with there is the guide afforded by the protected "gumba" communities on Rusinga Island itself. These are composed of the same species found elsewhere on the island, but the trees are much taller, the canopy is much denser (in places being closed), and the ground vegetation is much thicker. They are present at random points along the shore, being the places where the incoming Luos happened to come to land, and as such they can be taken to be typical of what the lake shore vegetation would be were it undisturbed by man. It should be classified on this basis as woodland.

On the higher slopes of Rusinga Island there is no such guide to the natural vegetation. There are, however, areas where the vegetation is less disturbed and where probably it has not been cleared for the last 30 years at least. Here, dense thickets of trees (over 6 m high) are interspersed with glass grades on thin soil and isolated groups of trees. This can probably be taken to indicate that thickets form a part of the natural vegetation of the island, the rest consisting of either bushland or woodland. This agrees with the broad classification of the area as "intermediate semi-evergreen thicket" (Trapnell & Griffiths 1960).

These two lines of evidence are supported by some other considerations. The rainfall over the area is relatively high, 800–1000 mm, and is distributed throughout the year, there being no well defined dry season. This is quite a high rainfall for this altitude, and should be sufficient to support dense stands of trees. Another consideration is the comparison of the Rusinga area with the detailed vegetation survey of Uganda (Langdale-Brown, Osmaston & Wilson 1964). From this the vegetation of Rusinga Island compares closely with the "undifferentiated moist semideciduous thicket" (G1 in their classification) which occurs along the Uganda shore of Lake Victoria up to the border of Kenya, and which passes into "moist *Combretum* savanna" (K) and "*Combretum-Hyparrhenia* savanna" according to their classification. Both the latter types are said to be fire climax, and having a mean annual rainfall of 800–1500 mm, would probably succeed to semi-deciduous thicket; this in turn is suggested as a successional stage leading to a forest climax (Langdale-Brown, Osmaston & Wilson 1964, pp. 53, 57 and 60). The similarity of this sequence with that of the area around Rusinga Island is striking; firstly the correspondence in species and tree density at the shore; and secondly the similarity of inland vegetation types between Lambwe Valley and the area around Bunwale.

It is concluded, therefore, that the natural vegetation of Rusinga Island, free from the influence of man, would consist of two zones of woodland: along the lake a moist form of semideciduous woodland with closed canopy in places and grass glades due to either hippo grazing or to waterlogged soil; and on the slopes of the hills a (semi) deciduous woodland with thickets, with grass glades where the soil is thin. The typical tree species would probably be *Albizia* spp., *Acacia* spp., *Sapium ellipticum*, *Grewia mollis* and *Lannea stuhlmannii*.

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TABLE 1

VEGETATION LIST FOR RUSINGA ISLAND

Family	*Name and Authority*	*Dholuo Name*
Gramineae	*Sporobolus agrostoides* Chiov.	Abinywe
	Hyparrhenia rufa (Nees) Stapf.	Ogare
	Themeda triandra Forsk.	Akwar
Anacardiaceae	*Lannea stuhlmanii* (Engl.) Engl.	Kuogo
	Pseudospondias microcarpa (A. Rich.) Engl.	Ochol
	Rhus natalensis Krauss	Sangla
Annonaceae	*Annona senegalensis* Pers.	Obolo
Apocynaceae	*Carissa edulis* (Forsk.) Vahl	Ochuoga
Balanitaceae	*Balanites aegyptiaca* (L.) Del.	Odho
Bignoniaceae	*Markhamia platycalyx* (Bak.) Sprague	Siala
	Kigelia africana (Lam.) Benth.	Yago
	Stereospermum kunthianum Cham.	Pololok
Boraginaceae	*Cordia ovalis* DC.	Oseno
Burseraceae	*Commiphora* sp.	Arupien
Caesalpiniaceae	*Tamarindus indica* L.	Chwa
Capparidaceae	*Maerua angolensis* DC.	Amoyo
Celastraceae	*Maytenus senegalensis* (Lam.) Exell	Achuodo
Compositae	*Vernonia amygdalina* Del.	Melosia
Euphorbiaceae	*Bridelia micrantha* (Hochst.) Baill.	Athuno
	Croton dichogamus Pax	Ang'we
	Sapium ellipticum (Krauss) Pax	Ochak
	Neoboutonia melleri (Muell. Arg.) Prain	Opok
	Euphorbia candelabrum Kotschy	Bondo
	E. tirucalii L.	Ojuok
Mimosaceae	*Albizia coriaria* Oliv.	Ober
	A. zygia (DC.) Macbr.	Oturbam
	Acacia seyal Del.	Ale
	A. senegal (L.) Willd.	Kiluor
	A. sieberana DC.	—
	A. brevispica Harms	Osiri
	A. drepanolobium Sjoestedt	Dunga
	A. hockii De Wild.	Arumbe
Moraceae	*Ficus capensis* Thunb.	Ngou
	F. sycomorus L.	Bongo
Myrtaceae	*Syzygium guineense* (Willd.) DC.	—
Olacaceae	*Ximenia americana* L.	Olemo
Papilionaceae	*Erythrina abyssinica* DC.	Orembe
Rhamnaceae	*Scutia myrtina* (Burn. f.) Kurz	Migodha
	Zizyphus mucronata Willd.	Lango
Rubiaceae	*Canthium schimperanum* A. Rich.	Kango
Sapindaceae	*Haplocoelum foliolosum* (Hiern) Bullock	Ahundwi
Simaroubaceae	*Harrisonia abssinica* Oliv.	Pedo
Tiliaceae	*Grewia mollis* A. Juss.	Aroyo

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BIRDS RECORDED ON THE KIMILILI TRACK, MT. ELGON, KENYA

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Mt. Elgon is a gently-sloping, comparatively isolated mountain straddling the Kenya/Uganda border at 1°N, 34°30′E, with a peak at 4300 m. Its avifauna is well-known (see especially Granvik 1923, 1934). The Kimilili track is motorable to above 3500 m, traversing one of the widest parts of the mountain. This southern slope is comparable in extent with the northern slope in Uganda, but the eastern and western slopes are far steeper. In climbing from 2400 to 3500 m one covers about 25 km.

The authors and their wives conducted a census, and selectively collected birds at five main localities along the track from 24th December 1969 to 7th January 1970. We were accompanied by Loriu Lokiru of the National Museum, Nairobi, and grateful acknowledgment is made to the Museum both for his services as a skinner and for the provision of a vehicle and petrol. We are also grateful to the Forester, Kimilili Forest Station for his considerable help. In July 1971 the Brittons and C. F. Mann visited this area again, camping for one night at a sixth locality. At the time of the first visit habitats above about 2300 m were quite intact, but a logging camp has since been established at about 2600 m and the forest above this level is being rapidly destroyed.

Dale (1940) describes the vegetation of the mountain in general terms but the impression given is rather misleading. For example, on this part of the mountain at least, there is a mosaic of bamboo and forest from about 2450 to 2900 m rather than large areas occupied by bamboo alone. And the percentage of forest does not lessen with increased altitude within the bamboo zone. In fact our camps between 2600 and 2800 m were dominated by forest rather than bamboo.

An attempt has been made to show the approximate altitudinal range for each species by using the numerals 1–6 in the systematic list, where a particular numeral means that it was recorded at that locality, defined as follows:

1. 2400 m (7800 ft) in forest (especially *Neoboutonia macrocalyx* Pax trees) with virtually impenetrable undergrowth; below the bamboo line (the contour *below* which bamboo does not occur); 6 days, January.
2. 2500 m (8100 ft) in bamboo, forest edge (*Neoboutonia* again abundant) and natural glades; 1½ days, December.
3. Between 2600 and 2700 m (altitude less accurately known than for other localities as no altimeter available) in *Podocarpus* forest and bamboo; 1 day, July.
4. 2800 m (9100 ft) in habitat like 3; 4 days, December.
5. 3200 m (10500 ft) in giant heather along a stream (lower moorland or heath zone); 1½ days, December.

6. 3400 m (1100 ft) in moorland with giant heather along streams; 3 days. According to Moreau (1966) afroalpine moorland occurs from 3500 to 4100 m upwards on different mountains. Moorland species (i.e. away from streams) at this locality may be included in the afroalpine moorland avifauna.

Additional random observations elsewhere along the track are included. The list should not be considered as complete. It is not intended to be a "checklist" of Mt. Elgon birds.

DISCUSSION

A comparison of the number of species at different localities shows a clear impoverishment with increased altitude: 2400 m, 58; 2500 m, 41; 2600–2700 m, 40; 2800 m, 36; 3200 m, 14; 3400 m, 15; 4300 m, 7. The most apparent reductions are between 2400 and 2500 m (the bamboo line) and between 2800 and 3200 m (the tree line). Only 26 of the 58 species recorded at 2400 m were also recorded at 2500 m. Were we able to spend a little longer at this second locality we would very probably have recorded a few more species, but we doubt that more than about half of the 58 species occur at 2500 m. There is also considerable variation in the species composition within the bamboo zone even though the total is fairly constant. For example, only 23 of the 41 species recorded at 2500 m were recorded at 2600 m whereas 26 of these 41 species were recorded below the bamboo line at 2400 m. The variation in forest types intermingling with the bamboo probably accounts for much of this, as at 2500 m the dominant tree is probably *Neoboutonia* sp. whereas at 2800 m it is *Podocarpus* sp. To an ornithologist the only common factor in these two habitats is the bamboo.

BREEDING SEASONS AND MOULT

A total of 362 birds were ringed between 25th December and 6th January, virtually all at 2400, 2500 or 2800 m. Primary moult scores were noted in the 350 passerines and the 10 *Turtur tympanistria* using the methods of Evans (1966). If there are nine long primaries, as in most passerines, these scores range from 0 (primary moult not yet started) to 45 (primary moult completed). Discussion is confined to those 29 species where three or more individuals were ringed (see the Systematic List). Of 342 birds, only those detailed below exhibited primary moult, a total of 53 birds of 10 species. So little active moult, together with the breeding data in the Systematic List, suggests that many species were either breeding, soon to breed, or recently finished; and more than half of our 96 specimens had enlarged gonads. According to the map in Griffiths (1958), Mt. Elgon has an April-September only rainfall regime, but our data indicate a much later breeding season for most species. Birds breeding during this wettest period would very likely be moulting primaries in December and January. All ringed birds were caught in mist nets within about 3 m of the ground so that any conclusions based solely on moult data may refer only to species occupying the forest undergrowth, bamboo or heather. Canopy and mid-stratum dwellers may be thought to breed earlier (in the rains) but the high incidence of gonad activity in these species suggests that they may reasonably be included with the netted birds. It may be concluded, then, that the modal period for egg-laying on the southern slopes of Elgon is from about November to January.

It is noteworthy that Betts (1966) considered September-December the modal egg-laying period on the Mau ridge, south east of Elgon at about 2500-3000 m. This area experiences an April-November rainfall regime, heaviest in July and August. Judging from Bett's systematic list, September is far less important than the later months, especially November and December, so that the modal egg-laying period in the two areas may be more or less the same.

It is likely that the months of heaviest rainfall are *too* wet in both these highland forests so that they are not favoured for breeding by most species. Cold and mist may

well be important controlling factors; and such areas are probably seldom so lacking in moisture that the onset of the main rains has the profound effect on breeding so apparent at lower altitudes.

Andropadus tephrolaemus: 18 scores ranged from 3–14, mean 7.4; one score of 43.
Chloropeta similis: score of 33.
Phylloscopus trochilus: scores of 5, 17, 22; palaearctic migrant.
Cisticola hunteri: score of 43 (male).
Nectarinia preussi: scores of 2, 5, 8, 10, 10, 19, 20; one of these was a case of interrupted moult (two renewed primaries giving a score of 10).
N. tacazze: Of six females, three were in moult with scores of 42, 3 and 4. Thirteen of the fifteen males were in moult. An immature male had a score of only 3 but otherwise the smallest score was 20, with nine out of twelve adult male scores between 20 and 33 (mean 26.0). The remaining three had scores of 40, 44 and 45. Thus, most males were about half-way through their primary moult whereas females were either not moulting at all, just starting, or just finishing. We are unable to interpret this considerable difference in moulting schedules between the sexes.
Zosterops senegalensis: scores of 33, 44, 45.
Serinus striolatus: score of 13.
S. burtoni: score of 6.
Ploceus baglafecht: immature, score of 34; no moult in four adults.

ALTITUDINAL MOVEMENT

In December 1969, three *Nectarinia* sunbirds, *preussi*, *tacazze* and *reichenowi*, were exceedingly common at 2800 m, and they were also noted lower down (see Systematic List). Our camp in July was in habitat identical to that at 2800 m yet we saw *preussi* only twice, *tacazze* only once, and *reichenowi* not at all. There was certainly a dearth of flowering trees and plants in July and these sunbirds had clearly moved elsewhere. P.L.B.'s data on *reichenowi* from Central Nyanza, at much lower altitude less than 150 km away, strongly suggest that this species at least has a regular altitudinal movement after breeding.

According to White (1963), *Nectarinia reichenowi* does not occur below 5000 ft (*c.* 1550 m) but most Central Nyanza records are at 1170 m or 1300 m with one at 1500 m and one at 1550 m. It has been recorded on eleven dates (up to four together) between 13th May and 3rd September 1969 and 20th March and 27th May 1970. The only collected bird was a female at Ng'iya on 13th May with no gonad activity. The stage of primary moult was noted in all five ringed birds: no moult on 11th and 22nd May (both females); scores of 1 on 25th May (female), 44 on 19th July (male), and 42 on 3rd September (male). A moult schedule from about May to September is completely out of phase with other Nyanza sunbirds, as is the non-breeding female in May. Virtually all moult in Nyanza-breeding *Nectarinia* spp. is from July to November with modal egg-laying months probably March to June (Britton in prep.). The moult of *reichenowi* in Central Nyanza is entirely consistent with the Elgon breeding schedule suggested above, and it should be noted that no Elgon bird was in moult in December. But, as it is also consistent with the breeding schedule of Mau birds, for which Betts (1966) gives nests in November, December and January, it is not certain in which highland forest they breed. Central Nyanza is probably too low for *preussi* and *tacazze* even as non-breeding visitors.

CISTICOLA HUNTERI AND *CISTICOLA CHUBBI*

Following the suggestion of A.D. Forbes-Watson we made a special effort to investigate the exact ranges of these two species, so that they form some 20 per cent of the whole collection. Their virtual allopatry is well shown by Hall & Moreau (1970), and Mt. Elgon occupies a special place as the only area where they both occur. On Elgon, *hunteri* occupies higher altitudes than *chubbi* but there is confusion as to the precise area of contact, if any. Most authors (Hall & Moreau *op. cit.*, Jackson 1938, Lynes 1930, White 1962a) say that *hunteri* occurs down to 9000 ft whereas Granvik (1923) recorded it only above 11000 ft. Although stating that it occurs above 9000 ft, Jackson (*op. cit.*) says that it occurs only in the alpine zone above the forest. White (*op. cit.*) has departed from other authors in treating the two forms as conspecific under the name *hunteri*. The evidence presented below shows that White's arrangement is untenable.

Table I

CISTICOLA HUNTERI (H) AND *C. CHUBBI* (C) COLLECTED ALONG THE KIMILILI TRACK, MT. ELGON, KENYA.

		Males		*Females*		
Altitude (m)	*No.*	*Wing (mm)*	*Weight (g)*	*Wing (mm)*	*Weight (g)*	*Habitat*
3400	H2	62	16·9			Alpine moorland.
	H5[a]			68	15·9	
2800	H36			60	15·0	Glade in *Podocarpus* forest.
	H37	65	16·8			
	H39			59	14·2	
	H40	63	16·5			
	H46	63	16·0			
2550	H93	62	16·0			Large Glade by rocks in mixed bamboo and *Podocarpus* forest.
	C92[b]	62	18·0			
2500	H83[a]	60	14·0			Glade in bamboo/thick scrub.
	C84			59	12·5	
	C85			59	13·5	
	C90			62	16·0	
	C91	63	17·0			
2450	C88			60	15·2	Glade in bamboo/thick scrub.
	C89	62	19·3			
2400	C86	65	17·0			Scrub by road.
	C87			58	15·0	
	C95	66	16·5			
2400	C71	66	17·5			Along stream in forest.

[a] H5 and H83 are probably wrongly sexed; their measurements are ignored in the discussion.

[b] C92 was badly shot and could not be sexed; it is put with the males because of its measurements and is included in the discussion

Table I lists all twenty specimens and shows clearly that there is an area of slight overlap between about 2500 and 2550 m (8100 ft–8300 ft) in the bamboo zone. Our specimens 92 and 93 were collected within 100 m of one another at 2550 m. The critical specimens are the *chubbi* from 2550 m (no. 92) and the *hunteri* from 2500 m (no. 83). No. 92 could not be sexed but no. 83 (a male) exhibited gonad activity (testes 4×2, 2.5×1.5 mm) as did most of the other specimens from all altitudes. In view of this, as well as the widespread song, it is unlikely that the overlap was the result of off-season wandering.

No intergradation is apparent in any of the specimens, neither has it been suggested before, and the two forms are very distinct in plumage as well as song. We were unable to tape either song on Elgon but have since taped *chubbi* at Kakamega and *hunteri* on Mt. Kenya. When the song of *chubbi* was played to singing *hunteri* on Mt. Kenya it caused no response. It would be interesting to show these songs on a sonogram although there is no disputing that they sound very different.

It is apparent from Table I that *chubbi* is a larger bird than *hunteri*. In males, *chubbi* wings average 64.0 compared with 63.0 in *hunteri*, and weights average 17.6 in *chubbi* compared with 16.4 in *hunteri*. The difference in weight is significant (*t*-test, $P<0.05$) although the difference in wing-length is not. Sexual dimorphism in size is very marked in *chubbi* with males larger (mean wing-length 64.0 against 59.6, mean weight 17.6 against 14.4, both significant, *t*-test, $P<0.01$). There are rather few female *hunteri* but less sexual dimorphism is apparent here, so that the difference between female *chubbi* and female *hunteri* is trivial. At the time of collecting or ringing, *chubbi* shows a markedly stronger and paler tarsus than *hunteri*. Were *hunteri* and *chubbi* conspecific one would expect *hunteri* to be larger as it occupies higher altitudes.

In view of the above, the classification proposed by White (1962a) is unacceptable. *Cisticola hunteri* and *Cisticola chubbi* should be retained as different species within a superspecies, an arrangement also proposed by Hall & Moreau (1970).

SYSTEMATIC LIST

With the exception of *Cisticola hunteri* and *C. chubbi*, order and nomenclature follow White (1960, 1961, 1962a, 1962b, 1963, 1965). Collected species are marked with an asterisk. Species considered under the heading BREEDING SEASONS AND MOULT are marked 'M', the figure in parenthesis indicating the sample size.

Circus macrourus/pygargus, "Ring-tail" Harrier: **6**, 26th December.
Buteo rufofuscus, Augur Buzzard: **1–6**, also summit (4300 m).
B. oreophilus*, Mountain Buzzard: **3, **5**.
Lophaetus occipitalis, Long-crested Eagle: **3** and 2300 m.
Stephanoaetus coronatus, Crowned Hawk Eagle: **2** and 2300 m.
Milvus migrans parasitus, Yellow-billed Kite: 2100 m.
Falco biarmicus, Lanner: **5**.
F. tinnunculus, Abyssinian Kestrel: **6** and summit (4300 m).
Francolinus psilolaemus*, Montane Red-wing: **6 and up to 3900 m.
F. squamatus*, Scaly Francolin: **1, **2**, **4**, shelled oviduct eggs, December and January.
Sarothrura sp., Pygmy Rail: **5**, a pair, probably *S. affinis* at this altitude (Keith *et al.* 1970). No *Sarothrura* has been recorded from Mt. Elgon.
Columba guinea, Speckled Pigeon: pair on summit (4300 m).
C. arquatrix*, Olive Pigeon: **1–4.
C. delegorguei*, Bronze-naped Pigeon: **1.
Streptopelia lugens*, Pink-breasted Dove: **5.
Turtur tympanistria, Tambourine Dove: **1**, **2**. M (10).
Poicephalus gulielmi, Red-headed Parrot: **3**, **4**.
Tauraco hartlaubi*, Hartlaub's Turaco: **1–4.
Chrysococcyx klaas, Klaas' Cuckoo: **1**.
Ciccaba woodfordi, African Wood Owl: heard **3**.
Caprimulgus poliocephalus*, Abyssinian Nightjar: **4, incubating fresh egg, c/l, 31st December.
Apus aequatorialis, Mottled Swift: 2000 m.
Colius striatus, Speckled Mousebird: 2300 m.
Phoeniculus purpureus, Red-billed Wood-Hoopoe: **4**.
P. bollei, White-headed Wood-Hoopoe: **1**, **3**.
P. cyanomelas, Scimitar-Bill: **1**.
Tockus alboterminatus, Crowned Hornbill: **3**.
Bycanistes subcylindricus, Black-and-White Casqued Hornbill: **1–4**.
Gymnobucco bonarpartei, Grey-throated Barbet: **1**.
Pogoniulus bilineatus, Golden-rumped Tinker-Barbet: **1**, **3**.
Trachyphonus purpuratus, Yellow-billed Barbet: **1**, **4**.
Indicator indicator, Greater Honeyguide: heard **3**.
Indicator (*minor*), Lesser Honeyguide: glimpsed **1**.
Dendropicos fuscescens*, Cardinal Woodpecker: **1, **3**.
Thripias namaquus*, Bearded Woodpecker: **1.
Mirafra sp., Lark: one on summit. This should be looked for in the future. Like the *Anthus* and *Macronyx* (see below) any *Mirafra* would be an addition to the afroalpine fauna of East Africa (see Moreau 1966).
Hirundo daurica*, Red-rumped Swallow: **2 and 2300 m.
Psalidoprocne pristoptera*, Black Roughwing: **2–5.
Anthus novaeseelandiae*, Richard's Pipit: **6 and on football field near **5**. Like the next species, not included in the afroalpine fauna of East Africa by Moreau (1966); yet collected at 11000 ft (*cf.* our locality **6** at 11100 ft) by Loven (in Granvik 1923).
Macronyx sharpei*, Sharpe's Longclaw: Two females collected at **6 weighed 28 and 29 g, wing-lengths 85 and 86 mm. Not previously recorded from Mt. Elgon although known from geographically near localities at lower altitude; in particular Jackson's (1938) Malawa River specimen which is the plot apparently on Mt. Elgon in Hall & Moreau (1970) (Hall *in litt.*). Both Jackson (*op. cit.*) and White (1961) record it only from 7000 to 8000 ft so that our specimens from 3400 m (11100 ft) are unexpected. We have compared them with a rather variable series of 25 specimens from the Kinangop Plateau in the National Museum from which they do not obviously differ. Seven of the Kinangop birds are females. Their wing-lengths range from 81 to 87, mean 84.0 mm., marginally shorter than our two birds. Not included in the afroalpine fauna of East Africa by Moreau (1966). If found on Uganda Elgon it would represent an addition to the avifauna of that country.
Laniarius luehderi, Lühder's Bush Shrike: **1**. M (4).
L. ferrugineus, Tropical Boubou: **1**, **2**.
Lanius collaris, Fiscal: 2500 m.
Oriolus larvatus percivali:* Black-winged Oriole: **1.
Poeoptera stuhlmanni, Stuhlmann's Starling: **3** (C. F. Mann).

Onycognathus walleri*, Waller's Chestnut-winged Starling: **1.
Cinnyricinclus sharpei*, Sharpe's Starling: **3, 4.
Corvus albicollis, White-necked Raven: **3, 6**, and to 4100 m.
Coracina caesia, Grey Cuckoo-Shrike: **1–3.**
Campephaga sp., Cuckoo-Shrike: **1.**
Pycnonotus barbatus, Yellow-vented Bulbul: **1–4.** M (6).
Andropadus gracilirostris*, Slender-billed Greenbul: **1.
A. latirostris*, Yellow-whiskered Greenbul: common **1, 2; once **3.** M (34).
A. tephrolaemus*, Olive-breasted Mountain Greenbul: **2–4. M (37).
Phyllastrephus fischeri*, Fischer's Greenbul: **1, 2. M (3).
Saxicola torquata*, Stonechat: **5 and 2300 m.
Cercomela sordida*, Hill Chat: **6 and up to 4200 m. M (6).
Myrmecocichla aethiops, Ant-eater Chat: 2100 m.
Alethe poliocephala*, Brown-chested Alethe: **1, 2. M (7).
Pogonocichla stellata*, White-starred Bush-Robin: **1–4. M (11).
Cossypha caffra*, Robin-Chat: **2–4, 6, only common at **4.** M (9).
Turdus abyssinicus*, Olive Thrush: **3, 4, 6, common at **4.** M (8).
T. piaggiae*, Abyssinian Ground Thrush: **4.
Alcippe abyssinica*, Abyssinian Hill Babbler: **1–3. M (8).
Trichastoma pyrrhoptera*, Mountain Illadopsis: **1.
Bradypterus cinnamomeus*, Cinnamon Bracken Warbler: **1–4. M (6).
Chloropeta similis*, Mountain Yellow Flycatcher: **1–4. M (8).
Sylvia atricapilla*, Blackcap: **1, 2, 4, common. M (33).
Phylloscopus trochilus*, Willow Warbler: **1, 2. M (3).
P. umbrovirens*, Brown Woodland Warbler: **1, 3, 4, 6.
Cisticola hunteri* and **C. chubbi*: **1–6, see page 4–5. M (7).
Prinia leucopogon, White-chinned Prinia: **1.**
Apalis pulchra*, Black-collared Apalis: **1. M (4).
A. jacksoni, Black-throated Apalis: **1.**
A. rufogularis*, Black-backed Apalis: **1. White (1962a) records it up to about 6000 ft (*c.* 1850 m). An unsexed young bird was collected at 2400 m (7800 ft) where others were seen.
A. porphyrolaema*, Chestnut-throated Apalis: **1.
A. cinerea, Grey Apalis: **3** (C. F. Mann).
Eminia lepida, Grey-capped Warbler: **1.**
Bathmocercus cerviniventris*, Black-faced Rufous Warbler: **1.
Sylvietta leucophrys*, White-browed Crombec: **1, 2.
Muscicapa adusta*, Dusky Flycatcher: **1–5.
Melaenornis chocolatina, White-eyed Slaty Flycatcher: **1–4.** M (5).
Batis molitor, Chin-spot Batis: **1, 2.**
Platysteira cyanea/peltata, Wattle-eye: **2.**
Trochocercus longicauda, Blue Flycatcher: **1.**
Terpsiphone viridis, Paradise Flycatcher: **1, 2.**
Parus albiventris, White-bellied Tit: **1.**
Anthreptes collaris, Collared Sunbird: **2, 4.**
Nectarinia verticalis, Green-headed Sunbird: **1.**
N. venusta, Variable Sunbird: **2, 4.**
N. mediocris, Eastern Double-collared Sunbird: seen and heard singing **3** (C. F. Mann).
N. preussi*, Northern Double-collared Sunbird: **1–4. M (10)
N. tacazze*, Tacazze Sunbird: **2–5. M (21).
N. famosa*, Malachite Sunbird: **6, males building nests, late December.
N. reichenowi, Golden-winged Sunbird: **2, 4.** M (9).
Zosterops senegalensis*, Green White-eye: **1–6. M (37).
Serinus canicollis*, Yellow-crowned Canary: **4–6, and up to 4300 m. M (6).
S. citrinelloides*, African Citril: **1, 4.
S. striolatus*, Streaky Seed-eater: **1–6, and up to 4300 m. Two broods being fed by parents out of the nest on 24th and 25th December were probably from eggs laid in late November. M (29).
S. burtoni*, Thick-billed Seed-eater: **1, 3, 4. M (3).
Ploceus baglafecht, Reichenow's Weaver: **3, 4.** M (5).
P. melanogaster*, Black-billed Weaver: **1, 4. M (4).
P. insignis, Chestnut-capped Weaver: **1.**
Euplectes capensis, Yellow Bishop: 2100, 2200 m.
Passer griseus, Grey-headed Sparrow: 2100 m (forest station).
Cryptospiza salvadorii*, Abyssinian Crimson-wing: **2–4. Three incompletely grown juveniles netted on 31st December were probably from eggs laid in early December. M (9).
Estrilda melanotis, Yellow-bellied Waxbill: **2.**
E. atricapilla, Black-headed Waxbill: **2–4.**

SUMMARY

Birds are listed from six main localities between 2400 and 3400 m along the Kimilili track, Mt. Elgon, Kenya. Impoverishment with increased altitude is marked, especially when pure forest gives way to a mosaic of bamboo and forest, and again when this mosaic gives way to moorland and giant heather.

Evidence from moult, breeding records and gonad activity suggests that the modal egg-laying period on the southern slopes of Elgon is from about November to January, after the main rains. An off-season, altitudinal movement of sunbirds is likely. Dates of occurrence of *Nectarinia reichenowi* in Central Nyanza, Kenya correlate with its absence from Elgon.

Cisticola hunteri and *C. chubbi* should be considered specifically distinct members of a superspecies.

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EAST AFRICAN BIRD RINGING REPORT 1971-1972

By

G. C. Backhurst

P.O. Box 29003, Kabete, Kenya

The total number of birds ringed in the twelve months under review (1st July 1971 to 30th June 1972) was 15679, 1758 fewer than in the previous year, however, the number of Palaearctic migrants ringed was up by nearly 400 to 11014. A disappointing aspect of this year's report is the small number of overseas recoveries; no explanation can be given for this and it is hoped that next year the figures will improve.

Only fifteen ringers were operating in the three East African countries of Kenya, Tanzania and Uganda during the year, a drop of six from the previous year's total; it should be mentioned that most of the birds were ringed by only four ringers.

In the list of birds ringed (Table 1) nomenclature follows the lists of C.M.N. White (references given in the 1968-1969 ringing report, this *Journal* 28(119): 16-26).

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Ringers gratefully acknowledge the co-operation of the City Engineer, Nairobi for allowing them to operate at Kariobangi Sewage Works; the Director of the Kenya National Parks for permission to ring at Lake Nakuru and in Tsavo National Parks; the Director of Veterinary Services, Kenya for permission to ring on certain land at Kabete. The Society is also grateful to the Administrative Director of the National Museum, Nairobi for allowing the Museum's address to appear on the rings.

TABLE I

BIRDS RINGED BY THE EAST AFRICA NATURAL HISTORY SOCIETY RINGING ORGANIZATION

Palaearctic Migrants in Bold Type	1971-72	Grand Total
PODICIPEDIDAE		
Podiceps ruficollis Little Grebe	0	1
ARDEIDAE		
Ardeola ibis Cattle Egret	1	2
A. ralloides Squacco Heron	0	1
Ixobrychus minutus minutus European Little Bittern	0	1
I. minutus payesii African Little Bittern	0	1
Nycticorax nycticorax Night Heron	0	1
PHOENICOPTERIDAE		
Phoenicopterus minor Lesser Flamingo	1	13
THRESKIORNITHIDAE		
Bostrychia hagadash Hadada Ibis	1	1
Platalea alba African Spoonbill	0	73
Plegadis falcinellus Glossy Ibis	4	4
Threskiornis aethiopica Sacred Ibis	0	7
ANATIDAE		
Alopochen aegyptiaca Egyptian Goose	0	1
Anas capensis Cape Wigeon	76	369
A. erythrorhynchos Red-billed Duck	22	76
A. hottentota Hottentot Teal	7	128
A. querquedula Garganey	5	16
A. undulata Yellow-billed Duck	1	38
Netta erythrophthalma African Pochard	6	10
Dendrocygna bicolor Fulvous Tree-Duck	0	1
ACCIPITRIDAE		
Accipiter badius Shikra	0	3
A. minullus Little Sparrow Hawk	1	2
A. tachiro African Goshawk	0	1
Circus macrourus Pallid Harrier	0	1
Lophaetus occipitalis Long-crested Eagle	0	1
Melierax poliopterus Pale Chanting Goshawk	31	31
Milvus migrans migrans Back Kite	1	3
Milvus migrans ssp Kite	1	2
FALCONIDAE		
Falco biarmicus Lanner	0	4
F. cuvieri African Hobby	0	1
F. subbuteo European Hobby	0	4
Polihierax semitorquatus Pigmy Falcon	0	1
PHASIANIDAE		
Coturnix coturnix africana Quail	0	1
C. delegorguei Harlequin Quail	5	16
Francolinus coqui Coqui Francolin	1	2
F. sephaena Crested Francolin	0	1
RALLIDAE		
Fulica cristata Red-knobbed or Crested Coot	0	16
Gallinula chloropus Moorhen	0	1
Limnocorax flavirostra Black Crake	0	1
Porphyrio porphyrio Purple Gallinule	0	2
Porzana porzana Spotted Crake	0	1
Sarothura elegans Buff-spotted Crake	0	1
S. pulchra White-spotted Crake	1	4

Palaearctic Migrants in Bold Type	1970/71	Grand Total
CHARADRIIDAE		
Charadrius asiaticus Caspian Plover	0	1
C. dubius Little Ringed Plover	0	19
C. hiaticula Ringed Plover	33	137
C. leschenaultii Great Sand Plover	0	9
C. marginatus White-fronted Sand Plover	0	1
C. mongolus Mongolian Sand Plover	5	11
C. pallidus Chestnut-banded Sand Plover	0	100
C. pecuarius Kittlitz's Sand Plover	33	250
C. tricollaris Three-banded Plover	6	61
Vanellus armatus Blacksmith Plover	39	215
V. coronatus Crowned Lapwing	0	4
V. melanopterus Black-winged Plover	9	9
V. spinosus Spurwing Plover	2	18
DROMADIDAE		
Dromas ardeola Crab Plover	0	2
GLAREOLIDAE		
Cursorius chalcopterus Violet-tipped Courser	0	1
Glareola pratincola Pratincole	2	3
JACANIDAE		
Actophilornis africana Jacana	6	7
LARIDAE		
Larus cirrocephalus Grey-headed Gull	0	5
Sterna anaethetus Bridled Tern	1	1
S. dougallii Roseate Tern	0	28
S. hirundo Common Tern	0	1
S. leucoptera White-winged Black Tern	35	246
S. nilotica Gull-billed Tern	1	8
S. repressea White-cheeked Tern	5	8
PHALAROPIDAE		
Phalaropus lobatus Red-necked Phalarope	1	3
RECURVIROSTRIDAE		
Himantopus himantopus Black-winged Stilt	60	131
Recurvirostra avosetta Avocet	29	48
RHYNCHOPIDAE		
Rhynchops flavirostris Skimmer	1	2
ROSTRATULIDAE		
Rostratula benghalensis Painted Snipe	5	24
SCOLOPACIDAE		
Arenaria interpres Turnstone	0	1
Calidris alba Sanderling	0	1
C. ferruginea Curlew Sandpiper	72	338
C. minuta Little Stint	1016	4325
C. subminuta Long-toed Stint	0	1
C. temminckii Temminck's Stint	10	22
Gallinago gallinago Snipe	28	99
G. media Great Snipe	0	44
G. nigripennis African Snipe	1	34
G. stenura Pintail Snipe	0	1
Limosa limosa Black-tailed Godwit	1	2
Numenius phaeopus Whimbrel	1	2
Philomachus pugnax Ruff	1140	3823
Tringa erythropus Spotted Redshank	0	1
T. glareola Wood Sandpiper	223	728
T. hypoleucos Common Sandpiper	26	196
T. nebularia Greenshank	3	12
T. ochropus Green Sandpiper	13	51

Palaearctic Migrants in Bold Type	1970/71	Grand Total
T. stagnatilis Marsh Sandpiper	337	895
T. terek Terek Sandpiper	1	7
COLUMBIDAE		
Columba guinea Speckled Pigeon	1	1
Oena capensis Namaqua Dove	6	11
Streptopelia capicola Ring-necked Dove	7	66
S. decipiens Mourning Dove	14	31
S. lugens Pink-breasted Dove	0	1
S. semitorquata Red-eyed Dove	0	8
S. senegalensis Laughing Dove	12	77
Turtur abyssinicus Black-billed Blue-spotted Wood Dove	0	2
T. afer Blue-spotted Wood Dove	11	93
T. chalcospilos Emerald-spotted Wood Dove	2	36
T. tympanistria Tambourine Dove	21	63
CUCULIDAE		
Centropus monachus Blue-headed Coucal	1	1
C. superciliosus White-browed Coucal	2	12
Ceuthmochares aereus Yellow-bill	2	3
Chrysococcyx caprius Didric Cuckoo	23	58
C. cupreus Emerald Cuckoo	3	6
C. klaas Klaas' Cuckoo	9	33
Clamator jacobinus Black and White Cuckoo	1	3
C. levaillantii Levaillant's Cuckoo	0	1
Cuculus canorus (Palaearctic race) European Cuckoo	4	5
C. canorus gularis African Cuckoo	1	1
C. clamosus Black Cuckoo	0	1
C. solitarius Red-chested Cuckoo	0	2
MUSOPHAGIDAE		
Tauraco hartlaubi Hartlaub's Turaco	0	2
STRIGIDAE		
Ciccaba woodfordii African Wood Owl	0	3
Glaucidium capense Barred Owlet	1	1
G. tephronotum Red-chested Owlet	0	1
Otus scops scops European Scops Owl	0	1
TYTONIDAE		
Tyto alba Barn Owl	0	1
CAPRIMULGIDAE		
Caprimulgus donaldsoni Donaldson-Smith's Nightjar	2	2
C. europaeus European Nightjar	1	2
C. fossii Gabon Nightjar	2	11
C. fraenatus Dusky Nightjar	0	1
C. inornatus Plain Nightjar	1	2
C. pectoralis Fiery-necked Nightjar	0	1
C. poliocephalus Abyssinian Nightjar	0	3
Macrodipteryx longipennis Standard-wing Nightjar	0	1
APODIDAE		
Apus affinis Little Swift	0	162
A. caffer White-rumped Swift	0	4
COLIIDAE		
C. macrourus Blue-naped Mousebird	25	105
C. striatus Speckled Mousebird	28	208
ALCEDINIDAE		
Alcedo cristata Malachite Kingfisher	0	68
Ceryle rudis Pied Kingfisher	306	446
Ceyx picta Pigmy Kingfisher	73	324

Palaearctic Migrants in Bold Type	1970/71	Grand Total
Halcyon albiventris Brown-hooded Kingfisher	0	4
H. chelicuti Striped Kingfisher	0	9
H. leucocephala Grey-headed Kingfisher	1	22
H. malimbica Blue-breasted Kingfisher	7	16
H. senegalensis Northern Woodland Kingfisher	2	21
H. senegaloides Mangrove Kingfisher	0	1
BUCEROTIDAE		
Tockus erythrorhynchus Red-billed Hornbill	0	1
T. jacksoni Jackson's Hornbill	1	1
CORACIIDAE		
Coracias caudata Lilac-chested Roller	0	1
C. garrulus European Roller	2	4
MEROPIDAE		
Merops albicollis White-throated Bee-eater	16	48
M. apiaster European Bee-eater	0	1
M. bullockoides White-fronted Bee-eater	0	6
M. muelleri Blue-headed Bee-eater	1	1
M. oreobates Cinnamon-chested Bee-eater	0	3
M. pusillus Little Bee-eater	0	10
M. superciliosus persicus Blue-cheeked Bee-eater	5	8
M. variegatus Blue-breasted Bee-eater	9	23
PHOENICULIDAE		
Phoeniculus cyanomelas Scimitar-Bill	4	11
P. minor Abyssinian Scimitar-Bill	0	7
P. purpureus Green Wood-Hoopoe	2	2
UPUPIDAE		
Upupa epops africana Africana Hoopoe	2	5
U. epops epops European Hoopoe	0	1
CAPITONIDAE		
Buccanodon duchaillui Yellow-spotted Barbet	0	2
B. leucotis White-eared Barbet	0	1
B. olivaceum Green Barbet	0	6
Gymnobucco bonapartei Grey-throated Barbet	0	2
Lybius bidentatus Double-toothed Barbet	3	21
L. guifsobalito Black-billed Barbet	3	10
L. hirsutus Hairy-breasted Barbet	1	1
L. lacrymosus Spotted-flanked Barbet	9	80
L. leucocephalus White-headed Barbet	1	11
L. leucomelas Red-fronted Barbet	10	38
L. melanocephalus Brown-throated Barbet	4	5
L. torquatus Black-collared Barbet	0	2
Pogoniulus bilineatus Golden-rumped Tinker-Bird	21	52
P. chrysoconus Yellow-fronted Tinker-Bird	9	45
P. leucomystax Moustached Green Tinker-Bird	1	2
P. pusillus Red-fronted Tinker-Bird	0	4
Trachyphonus darnaudii d'Arnaud's Barbet	15	38
T. erythrocephalus Red and Yellow Barbet	1	2
T. purpuratus Yellow-billed Barbet	0	6
INDICATORIDAE		
Indicator conirostris Thick-billed Honey-Guide	2	3
I. exilis Least Honey-Guide	1	2
I. indicator Black-throated Honey-Guide	4	17
I. minor Lesser Honey-Guide	7	37
I. variegatus Scaly-throated Honey-Guide	2	5
Prodotiscus regulus Wahlberg's Honey-Guide	2	3
PICIDAE		
Campethera abingoni Golden-Tailed Woodpecker	1	1

Palaearctic Migrants in Bold Type	1970/71	Grand Total
C. cailliautii Little Spotted Woodpecker	0	4
C. caroli Brown-eared Woodpecker	0	2
C. nivosa Buff-spotted Woodpecker	0	5
C. nubica Nubian Woodpecker	7	21
Dendropicos fuscescens Cardinal Woodpecker	4	20
D. poecilolaemus Uganda Spotted Woodpecker	1	2
Jynx torquilla Wryneck	1	3
ALAUDIDAE		
Calandrella cinerea Red-capped Lark	2	3
Eremopterix leucopareia Fischer's Sparrow Lark	0	1
Galerida cristata Crested Lark	1	1
Mirafra africana Rufous-naped Lark	4	8
M. rufocinnamomea Flappet Lark	0	15
CAMPEPHAGIDAE		
Campephaga phoenicea Black Cuckoo-Shrike	7	26
C. quiscalina Purple-throated Cuckoo-Shrike	3	6
CORVIDAE		
Corvus albus Pied Crow	1	1
DICRURIDAE		
Dicrurus adsimilis Drongo	5	13
D. ludwigii Square-tailed Drongo	0	1
EMBERIZIDAE		
Emberiza flaviventris Golden-breasted Bunting	2	13
E. tahapisi Cinnamon-breasted Rock Bunting	5	10
ESTRILIDAE		
Amandava subflava Zebra Waxbill	1	31
Clytospiza monteiri Brown Twinspot	4	29
Cryptospiza jacksoni Dusky Crimson-wing	0	2
C. reichenowi Red-faced Crimson-wing	1	1
C. salvadorii Abyssinian Crimson-wing	10	67
C. shelleyi Shelley's Crimson-wing	0	1
Estrilda astrild Waxbill	26	195
E. atricapilla Black-headed Waxbill	1	2
E. bengala Red-cheeked Cordon-bleu	45	164
E. cyanocephala Blue-headed Cordon-bleu	0	10
E. erythronotos Black-cheeked Waxbill	3	19
E. ianthinogaster Purple Grenadier	17	54
E. melanotis Yellow-bellied Waxbill	1	19
E. nonnula Black-crowned Waxbill	3	20
E. paludicola Fawn-breasted Waxbill	18	50
E. rhodopyga Crimson-rumped Waxbill	3	40
E. troglodytes Black-rumped Waxbill	1	2
Hypargos nitidulus Green-backed Twin-spot	5	8
H. niveoguttatus Peters' Twin-spot	0	3
Lagonosticta rhodpyreia Jameson's Firefinch	2	8
L. rubricata Africane Firefinch	5	31
L. rufopicta Bar-breasted Firefinch	6	35
L. senegala Red-billed Firefinch	62	275
Lonchura bicolor Rufous-backed Mannikin	12	32
L. cucullata Bronze Mannikin	37	309
L. griseicapilla Grey-headed Silverbill	0	3
L. malabrica Silverbill	1	1
Nigrita canicapilla Grey-headed Negro Finch	10	24
Ortygospiza atricollis Quail Finch	0	2
Pirenestes ostrinus Black-billed Seed-cracker	4	5
Pytelia melba Green-winged Pytilia	17	92
Spermophaga ruficapilla Red-headed Blue-bill	6	48
Vidua chalybeata Purple Indigobird	2	26
V. hypocherina Steel-blue Whydah	0	1
V. macroura Pin-tailed Whydah	10	70

Palaearctic Migrants in Bold Type	1970/71	Grand Total
EURYLAIMIDAE		
Smithornis capensis African Broadbill	1	1
FRINGILLIDAE		
Linurgus olivaceus Oriole Finch	1	1
Serinus atrogularis Yellow-rumped Seed-eater	23	111
S. burtoni Thick-billed Seed-eater	6	21
S. canicollis Yellow-crowned Canary	0	18
S. citrinelloides African Citril	35	72
S. dorsostriatus White-bellied Canary	25	105
S. gularis	0	21
S. koliensis Papyrus Canary	9	55
S. mozambicus Yellow-fronted Canary	31	152
S. striolatus Streaky Seed-eater	47	184
S. sulphuratus Brimstone Canary	14	115
HIRUNDINIDAE		
Delichon urbica House Martin	6	33
Hirundo abyssinica Striped Swallow	3	1109
H. angolensis Angola Swallow	14	169
H. daurica Red-rumped Swallow	11	455
H. fuligula African Rock Martin	1	18
H. griseopyga Grey-rumped Swallow	2	6
H. rustica European Swallow	685	6724
H. semirufa Rufous-chested Swallow	0	9
H. senegalensis Mosque Swallow	0	2
H. smithii Wire-tailed Swallow	11	171
Psalidoprocne albiceps White-headed Rough-wing	56	126
P. pristoptera Black Rough-wing	7	42
Riparia cincta Banded Martin	8	486
R. paludicola African Sand Martin	220	1573
R. riparia European Sand Martin	225	1358
LANIIDAE		
Dryoscopus cubla Black-backed Puff-back Shrike	5	17
D. gambensis Puff-back Shrike	3	15
Eurocephalus anguitimens White-crowned Shrike	6	7
Laniarius barbarus Black-headed Gonolek	12	77
L. ferrugineus Tropical Boubou	11	36
L. funebris Slate-coloured Boubou	3	29
L. luehderi Lühder's Bush Shrike	1	12
L. mufumbiri Papyrus Gonolek	4	5
Lanius cabanisi Long-tailed Fiscal	1	1
L. collaris Fiscal	17	73
L. collurio Red-backed and Red-tailed Shrikes	31	183
L. excubitorius Grey-backed Fiscal	0	11
L. mackinnoni Mackinnon's Shrike	0	1
L. minor Lesser Grey Shrike	2	4
L. senator Woodchat Shrike	0	1
Malaconotus blanchoti Grey-headed Bush Shrike	0	1
M. dohertyi Doherty's Bush Shrike	0	2
M. sulfureopectus Sulphur-breasted Bush Shrike	0	13
Nilaus afer Northern Brubru	0	5
Prionops plumata Curly-crested Helmet-Shrike	0	3
P. scopifrons Chestnut-fronted Shrike	7	7
Tchagra australis Brown-headed Bush Shrike	8	52
T. jamesi Three-streaked Bush Shrike	0	2
T. minuta Black-cap Bush Shrike	4	31
T. senegala Black-headed Bush Shrike	3	33
MOTACILLIDAE		
Anthus cervinus Red-throated Pipit	1	24
A. leucophrys Plain-backed Pipit	21	37
A. novaeseelandiae Richard's Pipit	8	96
A. sokokensis Sokoke Pipit	1	1
A. trivialis Tree Pipit	9	153

Palaearctic Migrants in Bold Type	1970/71	Grand Total
Macronyx aurantiigula Pangani Longclaw	1	1
M. croceus Yellow-throated Longclaw	8	29
Motacilla alba alba White Wagtail	0	5
M. alba vidua African Pied Wagtail	19	188
M. capensis Cape Wagtail	0	3
M. cinerea Grey Wagtail	0	2
M. clara Mountain Wagtail	1	4
M. flava Yellow Wagtail	4631	28764
Tmetothylacus tenellus Golden Pipit	2	2
MUSCICAPIDAE—MUSCICAPINAE		
Batis capensis Puff-back Flycatcher	6	9
B. minor Black-headed Puff-back Flycatcher	9	39
B. molitor Chin-spot Puff-back Flycatcher	4	20
B. soror Mozambique Puff-back Flycatcher	2	5
Bradornis microrhynchus Grey Flycatcher	5	28
B. pallidus Pale Flycatcher	1	3
Empidornis semipartitus Silver Bird	0	2
Erythrocercus holochlorus Little Yellow Flycatcher	4	4
Ficedulae hypoleuca Pied Flycatcher	0	2
Hyliota flavigaster Yellow-bellied Flycatcher	0	1
Melaenornis chocolatina White-eyed Slaty Flycatcher	24	55
M. edolioides Black Flycatcher	7	42
Muscicapa adusta Dusky Flycatcher	5	17
M. aquatica Swamp Flycatcher	7	19
M. caerulescens Ashy Flycatcher	0	4
M. griseigularis Grey-throated Flycatcher	3	6
M. striata Spotted Flycatcher	11	55
Myioparus plumbeus Grey Tit-Flycatcher	0	3
Platysteira blissetti Jameson's Wattle-Eye	4	34
P. cattanea Chestnut Wattle-Eye	1	14
P. cyanea Wattle-Eye	5	75
P. peltata Black-throated Wattle-Eye	1	13
Terpsiphone rufiventer Black-headed Paradise Flycatcher	2	4
T. viridis Paradise Flycatcher	14	76
Trochocercus albonotatus White-tailed Crested Flycatcher	2	11
T. cyanomelas Crested Flycatcher	3	3
T. longicauda Blue Flycatcher	4	17
T. nigromitratus	1	21
MUSCICAPIDAE—SYLVIINAE		
Acrocephalus arundinaceus arundinaceus / **A. arundinaceus zarudnyi** Great Reed Warbler	59	122
A. arundinaceus griseldis Basra Reed Warbler	4	8
A. boeticatus African Reed Warbler	7	14
A. gracilirostris Lesser Swamp Warbler	24	55
A. palustris Marsh Warbler	169	219
A. rufescens Greater Swamp Warbler	21	47
A. schoenobaenus Sedge Warbler	902	1345
A. scirpaceus Reed Warbler	192	848
Apalis cinerea Grey Apalis	3	5
A. flavida Black-Breasted Apalis	8	28
A. jacksoni Black-throated Apalis	2	2
A. pulchella Buff-bellied Warbler	4	15
A. pulchra Black-collared Apalis	3	20
Bathmocercus cerviniventris Black-faced Rufous Warbler	2	44
Bradypterus baboecala Little Rush Warbler	8	10
B. barratti Evergreen Forest Warbler	0	3
B. cinnamomeus Cinnamon Bracken Warbler	4	21
B. graueri carpalis White-winged Warbler	13	18
Camaroptera brachyura Grey-backed Camaroptera	88	357
C. chloronota Olive-green Camaroptera	5	42
C. simplex Grey Wren-Warbler	5	17
Chloropeta gracilirostris Yellow Swamp Warbler	3	3
C. natalensis Yellow Warbler	11	31
C. similis Mountain Yellow Warbler	11	26

Palaearctic Migrants in Bold Type	1970/71	Grand Total
Cisticola brachyptera Siffling Cisticola	1	2
C. brunnescens Pectoral-patch Cisticola	0	3
C. cantans Singing Cisticola	12	36
C. carruthersi Carruthers' Cisticola	20	35
C. chiniana Rattling Cisticola	33	68
C. cinereola Ashy Cisticola	1	1
C. erythrops Red-faced Cisticola	8	68
C. fulvicapilla Tabora Cisticola	1	1
C. galactotes Winding Cisticola	65	306
C. hunteri Hunters' Cisticola	20	43
C. juncidis Zitting Cisticola	0	9
C. lateralis Whistling Cisticola	0	3
C. natalensis Croaking Cisticola	3	29
C. robusta Stout Cisticola	3	37
C. woosnami Trilling Cisticola	0	10
Eminia lepida Grey-capped Warbler	24	123
Eremomela icteropygialis Yellow-bellied Eremomela	0	6
Hippolais icterina Icterine Warbler	1	4
H. languida Upcher's Warbler	3	10
H. olivetorum Olive-tree Warbler	3	4
H. pallida Olivaceous Warbler	17	67
Hylia prasina Green Hylia	9	27
Locustella fluviatilis River Warbler	22	29
Phylloscopus budongoensis Uganda Woodland Warbler	0	2
P. collybita Chiff-chaff	2	3
P. trochilus Willow Warbler	577	2225
P. umbrovirens Brown Woodland Warbler	1	32
Prinia bairdii Banded Prinia	6	22
P. leucopogon White-chinned Prinia	5	41
P. subflava Tawny-flanked Prinia	20	130
Schoenicola platyura Fan-tailed Warbler	0	1
Sphenoeacus mentalis Moustache Warbler	1	8
Sylvia atricapilla Blackcap	39	189
S. borin Garden Warbler	142	1035
S. communis Whitethroat	128	236
S. nisoria Barred Warbler	23	48
Sylvietta brachyura Crombec	9	27
S. leucophrys White-browed Crombec	0	5
S. virens Green Crombec	1	1
S. whytii Red-faced Crombec	13	50
MUSCICAPIDAE—TIMALIINAE		
Alcippe abyssinicus Abyssinian Hill Babbler	10	37
Trichastoma aibipecta Scaly-breasted Illadopsis	3	29
T. fulvescens Brown Illadopsis	8	27
T. poliothorax Grey-chested Illadopsis	0	3
T. pyrrhoptera Mountain Illadopsis	0	5
T. rufipennis Pale-breasted Illadopsis	6	33
Turdoides hypoleucos Northern Pied Babbler	0	2
T. fardinei Arrow-marked Babbler	0	11
T. melanops Black-lored Babbler	1	8
T. plebejus Brown Babbler	4	48
T. rubiginosus Rufous Chatterer	2	16
MUSCICAPIDAE—TURDINAE		
Alethe diademata Fire-crest Alethe	3	3
A. poliocephala Brown-chested Alethe	6	82
A. poliophrys Red-throated Alethe	0	1
Cercomela scotocerca Brown-tailed Rock Chat	3	3
C. sordida Hill Chat	0	7
Cercotrichas galactotes Rufous Bush Chat	19	19
C. hartlaubi Brown-backed Scrub-Robin	0	6
C. leucophrys Red-backed Scrub-Robin	16	97
C. quadrivirgata Eastern Bearded Scrub-Robin	5	12
Cichladusa guttata Spotted Morning Warbler	5	8
Cossypha archeri Archer's Robin Chat	0	1

Palaearctic Migrants in Bold Type	1970/71	Grand Total
C. caffra Robin Chat	24	67
C. cyanocampter Blue-shouldered Robin Chat	3	17
C. heuglini White-browed Robin Chat	21	172
C. natalensis Red-capped Robin Chat	11	54
C. niveicapilla Snowy-headed Robin Chat	4	37
C. polioptera Grey-winged Robin Chat	0	9
C. semirufa Rüppel's Robin Chat	1	9
Irania gutturalis White-throated Robin	11	14
Luscinia luscinia Sprosser	104	143
L. megarhynchos Nightingale	7	21
Monticola rufocinerea Little Rock Thrush	0	2
M. saxatilis Rock Thrush	1	25
Myrmecocichla aethiops Arteater Chat	1	1
M. nigra Sooty Chat	3	13
Neocossyphus poensis White-tailed Ant Thrush	1	9
Oenanthe isabellina Isabelline Wheatear	0	8
O. oenanthe European Wheatear	5	42
O. pileata Capped Wheatear	0	1
O. pleschanka Pied Wheatear	2	7
Phoenicurus phoenicurus Redstart	3	51
Pogonocichla stellata White-starred Bush Robin	15	73
Saxicola rubetra Whinchat	10	77
S. torquata Stonechat	4	18
Sheppardia aequatorialis Equatorial Akalat	9	68
Stizorhina fraseri	2	9
Turdus abyssinicus Mountain Thrush	14	123
T. fischeri Spotted Ground Thrush	3	3
T. pelios African Thrush	9	47
T. piaggiae Abyssinian Ground Thrush	0	6
NECTARINIIDAE		
Anthreptes collaris Collared Sunbird	8	41
A. longuemarei Uganda Violet-backed Sunbird	0	4
A. orientalis Violet-backed Sunbird	3	7
A. rectirostris Green Sunbird	0	1
Nectarinia alinae Blue-headed Sunbird	0	7
N. amethystina Amerthyst Sunbird	2	3
N. bifasciatus Little Purple Banded Sunbird	6	59
N. bouvieri Orange-tufted Sunbird	0	1
N. chloropygia Olive-bellied Sunbird	3	15
N. cuprea Copper Sunbird	13	152
N. erythroceria Red-chested Sunbird	9	402
N. famosa Malachite Sunbird	32	33
N. kilimensis Bronze Sunbird	77	170
N. mariquensis Mariqua Sunbird	23	142
N. mediocris Eastern Double-collared Sunbird	26	106
N. olivacea Olive Sunbird	30	135
N. preussi Northern Double-collared Sunbird	2	34
N. pulchella Beautiful Sunbird	23	126
N. regia Regal Sunbird	1	3
N. reichenowi Golden-winged Sunbird	113	121
N. senegalensis Scarlet-chested Sunbird	62	193
N. tacazze Tacazze Sunbird	0	38
N. venusta Variable Sunbird	53	128
N. verticalis Green-headed Sunbird	32	87
ORIOLIDAE		
Oriolus brachyrhynchus Western Black-headed Oriole	0	2
O. larvatus Black-headed Oriole	3	5
O. oriolus Golden Oriole	3	12
PARIDAE		
Parus albiventris White-bellied Tit	2	11
P. fringillinus Red-faced Tit	0	6
Remiz caroli African Penduline Tit	0	1

	1970/71	Grand Total
PITTIDAE		
Pitta angolensis African Pitta	2	2
PLOCEIDAE		
Bulbalornis albirostris Red-billed Buffalo Weaver	1	1
Passer eminibey Chestnut Sparrow	1	21
P. griseus Grey-headed Sparrow	21	187
P. iagoensis Rufous Sparrow	9	15
Petronia xanthocollis Yellow-spotted Petronia	1	12
Plocepasser donaldsoni Donaldson-Smith's Sparrow Weaver	0	5
P. mahali Stripe-breasted Sparrow Weaver	5	29
Sporopipes frontalis Speckle-fronted Weaver	0	8
Amblyospiza albifrons Grosbeak Weaver	4	12
Anomalospiza imberbis Parasitic Weaver	0	91
Euplectes afra Yellow-crowned Bishop	0	1
E. albonotatus White-winged Widow Bird	0	129
E. ardens Red-collared Widow Bird	0	56
E. axillaris Fan-tailed Widow Bird	33	354
E. capensis Yellow Bishop	1	2
E. gierowii Black Bishop	7	36
E. hordeaceus Black-winged Red Bishop	1	42
E. jacksoni Jackson's Widow Bird	0	3
E. macrourus Yellow-mantled Widow Bird	1	19
E. orix Red Bishop	1	18
Malimbus rubriceps Red-headed Weaver	0	2
M. rubricollis Red-headed Malimbe	0	2
Ploceus alienus Strange Weaver	2	4
P. aurantius Orange Weaver	9	17
P. baglafecht Baglafecht Weaver	39	272
P. bicolor Dark-backed Weaver	0	4
P. bojeri Golden Palm Weaver	1	2
P. castanops Northern Brown-throated Weaver	108	193
P. cucullatus Black-headed Weaver	59	569
P. golandi Clarke's Weaver	10	10
P. intermedius Masked Weaver	28	354
P. jacksoni Golden-backed Weaver	71	433
P. luteolus Little Weaver	15	43
P. melanocephalus Yelow-backed Weaver	106	1315
P. melanogaster Black-billed Weaver	5	16
P. nigerrimus Vieillot's Black Weaver	36	98
P. nigricollis Black-necked Weaver	34	73
P. ocularis Spectacled Weaver	27	214
P. pelzelni Slender-billed Weaver	47	387
P. rubiginosus Chestnut Weaver	1	26
P. spekei Speke's Weaver	2	121
P. subaureus Golden Weaver	0	2
P. superciliosus Compact Weaver	0	13
P. velatus Vitelline Masked Weaver	8	13
P. weynsi Weyn's Weaver	7	24
P. xanthops Holub's Golden Weaver	11	46
Quelea cardinalis Cardinal Quelea	3	122
Q. erythrops Red-headed Quelea	0	85
Q. quelea Red-billed Quelea	26	356
PYCNONOTIDAE		
Andropadus ansorgei Ansorge's Greenbul	0	3
A. curvirostris Cameroon Sombre Greenbul	6	36
A. gracilirostris Slender-billed Greenbul	0	1
A. importunus Zanzibar Sombre Greenbul	16	34
A. latirostris Yellow-whiskered Greenbul	95	570
A. milanjensis Stripe-cheeked Greenbul	0	2
A. montanus Shelley's Greenbul	4	15
A. tephrolaemus Olive-breasted Mountain Greenbul	2	79
A. virens Little Greenbul	79	181
Bleda syndactyla Bristle-bill	11	32
Chlorocichla flavicollis Yellow-throated Leaflove	13	59

	1970/71	Grand Total
C. flaviventris Yellow-bellied Greenbul	11	19
Criniger calurus Red-tailed Greenbul	3	3
Nicator chloris Nicator	4	7
Phyllastrephus albigularis White-throated Greenbul	11	35
P. baumanni Toro Olive Greenbul	1	9
P. debilis Smaller Yellow-streaked Greenbul	4	7
P. fischeri Fischer's Greenbul	25	95
P. strepitans Northern Brownbul	3	14
P. terrestris Brownbul	0	7
Pycnonotus barbatus Dark-capped or Yellow-vented Bulbul	169	1786
STURNIDAE		
Buphagus erythrorhynchus Red-billed Oxpecker	0	2
Cinnyricinclus leucogaster Violet-backed Starling	0	37
Creatophora cinerea Wattled Starling	3	42
Lamprotornis caudatus Rüppell's Long-tailed Glossy Starling	1	14
L. chalybaeus Blue-eared Glossy Starling	5	11
L. chloropterus Lesser Blue-eared Glossy Starling	0	2
L. corruscus Black-breasted Glossy Starling	3	7
Spreo hildebrandti Hildebrandt's Starling	1	18
S. superbus Superb Starling	1	22
ZOSTEROPIDAE		
Zosterops abyssinica Yellow White-eye	5	69
Z. senegalensis jacksoni Green White-eye	0	92
Z. senegalensis kikuyuensis Kikuyu White-eye	53	118
Z. senegalensis kulalensis Kulal White-eye	0	4
TOTAL BIRDS RINGED	15679	83935
TOTAL SPECIES RINGED	397	554
TOTAL PALAEARCTIC BIRDS RINGED	11014	55154
TOTAL PALAEARCTIC SPECIES RINGED	60	82

TABLE 2

RECOVERIES AND CONTROLS OF BIRDS RINGED IN EAST AFRICA

Key to symbols and terms

Ring number	:		— where this is in italics the ring has been returned.
Age	:	f.g.	— full grown, age uncertain;
		ad.	— adult;
		1W	— bird in its first winter;
		pull.	— young, not able to fly freely;
		juv.	— juvenile, able to fly freely.
Sex	:	♂	— male
		♀	— female.
Manner of recovery	:	+	— shot or killed by man;
		×	— found dead or dying;
		xA	— found long dead;
		/?/	— manner of recovery unknown;
		v	— caught or trapped alive and released with ring (control);
		()	— caught or trapped alive and not released, or released with ring removed.
Date of recovery	:		— given in the order: day, month, year. If the date is unknown, the date of the reporting letter is given in parentheses.
Distance (km)	:		— only given for recoveries within East Africa.
Elapsed time	:	e	— given in the form, years: months: days, thus 1:2:9 signifies that the bird was recovered 1 year 2 months 9 days after ringing.

Anas erythrorhynchos Red-billed Duck

D.0537	juv.♂	23. 6.64	Ngorongoro Crater, Tanzania 3°10′S., 35°35′E. JG.
	+	7. 6.72	*near* Karatu Mission, Tanzania 3°20′S., 35°40′E., *c.* 20 km SE, 7:11:14. J. Gibb.

Anas hottentota Hottentot Teal

D.0933	f.g.	24.11.68	Lake Nakuru, Kenya 0°20′S., 36°06′E. GCB.
	+	15. 1.72	Ol Donyo Ndorobo, *near* Makame, Tanzania *c.* 4°38′S, 36°44′E, *c.* 490 km SSE, 3:1:21. F.Miller.
D0939	f.g.	1. 2.69	Lake Nakuru, Kenya. GCB
	+	26.11.72	Ol Bolossat, Kenya 0°09′S., 36°26′E., 45 km NE, 3:9:25. A. Sheppard.
H0018	ad.	8 2.70	Naivasha, Kenya 0°43′S., 36°25′E. GCB.
	+	13. 8.72	Mwea, Kenya 0°43′S., 37°22′E., 105 km E, 2:5:5. (Bird contained eggs when shot.) H. Stirling.

Calidris ferruginea Curlew Sandpiper

A.5652	ad.	3. 5.69	Lake Nakuru, Kenya 0°20′S., 36°06′E. EDS.
	v	15.10.72	Lake Magadi, Kenya 2°00′S., 36°10′E., 185 km S, 3:5:12. (Reringed A. 19026.) GCB.
A.6413	f.g.	20.10.69	Lake Nakuru, Kenya. PLB.
	v	1.10.72	Lake Magadi, Kenya, 2:11:11. (Reringed A.15793.) GCB.
A.10371	f.g.	26. 9.70	Lake Nakuru, Kenya. MStJS.
	v	10. 9.72	Lake Magadi, Kenya, 1:11:14. GCB.

Philomachus pugnax Ruff

B.2511	ad.♀	8. 2.69	Lake Nakuru, Kenya 0°20′S., 36°06′E. GCB.
	+	19. 5.72	*near* Vilyuisk, Vilyuisk District, Yakut S.S.R., **U.S.S.R.** 63°45′N., 121°37′E., 3:3:11. (Ringing Centre, Moscow.)

Tringa glareola Wood Sandpiper

B.4537	ad.	7.11.69	Athi River, Kenya 1°26′S. 36°59′E. EDS.
	+	18. 5.72	*near* Koslan, Udorsk Region, Komi A.S.S.R., **U.S.S.R.** 63°28′N., 48°58′E., 2:6:11. (Ringing Centre, Moscow.)

Hirundo abyssinica Striped Swallow

J.41739	juv.	30. 8.70	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	v	19. 4.71	Karen, Nairobi, Kenya 1°20′S., 36°42′E., 20 km SW, 0:7:19. J.H. Gaylor.

Hirundo daurica Red-rumped Swallow

J.18873	ad.	17.10.68	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	v	15. 5.72	Firestone factory, Nairobi 1°21′S., 36°52′E., 8 km SSW, 3:6:28. (Caught at nest, paired with J.39430.) F. Shire.
J.39430	juv.	26. 7.70	Kariobangi, Nairobi. GCB.
	v	15. 5.72	Firestone factory (as above). 1:9:19.

Hirundo rustica European Swallow

J.42237	1W	10. 1.70	Kibebe Farm, Iringa, Tanzania (at roost) 7°46′S., 35°42′E. JFR.
	×	(7. 6.72)	Nürnberg, **Germany** 49°27′N., 11°05′E., *c.* 1:4:27. W. M. Fischer.
X.1026	ad.	25.10.70	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	()	28. 8.72	*near* Nizhnegorskii, Crimean Region, **U.S.S.R.** 45°27′N., 34°48′E., 1:10:3. (Ringing Centre, Moscow.)
J.50691	1W	5. 2.71	Kibebe Farm, Iringa, Tanzania (at roost). JFR.
	×	14. 6.72	*near* Tamishi, Ochamchire District, Georgian S.S.R., **U.S.S.R.** 42°38′N., 41°21′E., 1:4:11. (Ringing Centre, Moscow.)
J.41583	f.g.	9.10.71	Lake Nakuru, Kenya 0°20′S., 36°06′E. MStJS.
	+	30. 3.72	Halabja, Sulaymaniyah, **Iraq** 35°11′N., 45°59′E., 0:5:21. A. Qaradaghi.
J.71111	1W	23. 1.72	Kariobangi, Nairobi, Kenya. DJP.
	v	4. 5.72	*near* Zatsarevo, Narimanovskii District, Astrakhan' Region, **U.S.S.R.** 46°23′N., 48°03′E., 0:3:11. (Ringing Centre, Moscow.)

Motacilla flava Yellow Wagtail

J.14018	f.g.♀	19. 1.69	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	×	23.10.72	Katieno Sub-location, Maseno, Kenya 0°04′S., 34°30′E., 290 km NW, 3:9:4. T. Obadha.

Acrocephalus schoenobaenus Sedge Warbler

J.67274	f.g.	16. 4.72	Lake Nakuru, Kenya 0°20′S., 36°06′E. GCB.
	×	11. 8.72	*near* Novouzensk, Saratov Region, **U.S.S.R.** 50°30′N., 48°10′E., 0:3:25. (Ringing Centre, Moscow.)

Nectarinia reichenowi Golden-winged Sunbird

J.67921	f.g.♂	10. 5.72	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	× *cat*	(29.8.72)	South Kinangop, Kenya 0°43′S., 36°40′E., 65 km NNW, *c.* 0:3:19. P. Poli.

Kariobangi is 1600 m above sea level, South Kinangop is at 2530 m.

KEY TO INITIALS IN LIST OF RECOVERIES

GCB	G. C. & D. E. G. Backhurst
PLB	P. L. & H. A. Britton
JG	the late J. Goddard
DJP	D. J. Pearson
JFR	J. F. Reynolds
EDS	E. D. Steel
MStJS	M. StJ. & G. Sugg

OTHER RINGERS IN EAST AFRICA

Lise Campbell; D. Carthy; F. B. Gill; M. Goddard; J. F. & L. H. Harper; W. G. Harvey; C. F. Mann; N. O. Okia; Nina Pettitt; J. Rolf.

Notes.—The above lists do not total 15 as mentioned on page 1; this is because J. Goddard and Dr E. D. Steel were not ringing in 1971-72 and further, husband and wife teams are counted as one ringer on page 1.

TABLE 3

PALAEARCTIC BIRDS RETRAPPED AT ORIGINAL RINGING SITES DURING 1971-72 WHICH WERE RINGED IN PREVIOUS SEASONS

Calidris ferruginea Curlew Sandpiper	2
C. minuta Little Stint	40
Philomachus pugnax Ruff	56
Tringa glareola Wood Sandpiper	1
T. ochropus Green Sandpiper	2
T. stagnatilis Marsh Sandpiper	10
Hirundo rustica European Swallow	1
Acrocephalus arundinaceus Great Reed Warbler	1
A. schoenobaenus Sedge Warbler	1
A. scirpaceus Reed Warbler	1
Phylloscopus trochilus Willow Warbler	1
Luscinia megarhynchos Nightingale	1
Motacilla flava Yellow Wagtail	182

TABLE 4

RECOVERIES IN EAST AFRICA OF BIRDS RINGED ABROAD

The signs and symbols are the same as those used in Table 2.

Ciconia ciconia White Stork

Radolfzell

B 60009	pull.	2. 6.70	Korinos, **Greece** 40°19′N., 22°35′E.
	/?/	(13.1.72)	Kenya? The ring was handed into the National Museum Nairobi by C. Mitchell; it has been impossible to obtain any details from Mr Mitchell.

Larus fuscus Lesser Black-backed Gull

Helsinki

H.101655	pull.	22. 6.69	Prosten, Kristinestad, Vasa, **Finland** 62°18′N., 21°20′E. P-A. Johansson.
	× (*sick*)	2.12.72	*near* Dar es Salaam, Tanzania 6°51′S., 39°18′E., 3:5:10. G.D. Diva.

Acrocephalus palustris Marsh Warbler

Praha

M586437	ad.	3. 5.70	Velky pond, Nakri, Ceske Budejovice District, **Czechoslovakia** 49°07′N., 14°20′E. Zd. Pletka.
	v	24.11.71	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E., 1:6:21. (Ring returned, reringed Nairobi J.55879.) D. J. Pearson.

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A NEW POPULATION OF CARPET VIPERS *ECHIS CARINATUS* FROM NORTHERN KENYA

By

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In July 1971, during a herpetological survey of northern Kenya for the National Museums of Kenya and the California Academy of Sciences, R.C.D. collected a series of red Carpet Vipers, *Echis carinatus* (Schneider), from Wajir, Northeastern Province, Kenya. Additional field work has led us to believe that the population is isolated. Comparison with specimens from Turkana District, Lake Baringo and Moille Hill, Kenya, and with data on *E. c. pyramidum* (Geoffroy) from Egypt revealed differences which appear to be of sufficient significance to justify the description of a new taxon:

Echis carinatus aliaborri ssp. nov.

HOLOTYPE: CAS 130648, adult male, collected by R. C. Drewes, 15 July 1971, in a limestone area approximately 8 km north of Wajir, Wajir District, Kenya. We take pleasure in naming this taxon for Ali Ismael Haji Yussuf of Wajir.

PARATYPES (9 ♂♂, 11 ♀♀) CAS 130643-130652 collected at the type locality, 5 and 15 July 1971, by R. C. Drewes, Nicholas Boyd, John Miskell and Ali Ismael Haji Yussuf; CAS 130653–130658, taken between 9 and 14 July 1971, by Ali Ismael Haji Yussuf; and CAS 130662, 131677–131680 in Wajir town, vicinity of Catholic Mission, 24 June and 22–23 July 1971, by Stephen Spawls.

The holotype and 12 paratypes are to remain at the California Academy of Sciences; 8 paratypes will be sent to the National Museum, Nairobi.

DIAGNOSIS: A medium-small Carpet Viper, differing from other populations in vivid darkred colouration and possession of enlarged supraoculars on both sides.

DESCRIPTION OF HOLOTYPE:

Measurements (in mm). Head length 24; snout 5.5; diameter of eye 4; body length (snout to vent) 373; total length 419.

Scale Counts. Mid-body scale rows 30; ventrals 166; subcaudals 36; anal plate entire; 10 upper labials; 12 lower labials; scales around eye 15–14; enlarged supraoculars.

Colour in Life. Dorsal ground colour deep laterite red; eyes orange-red; ventral surface ivory with one or two small red spots per scute. (Based on colour slide of CAS 130644, holotype not photographed. Colour matched with plate 5, "Brick-dust red", IIL, *A Dictionary of Color*, A. Maerz & M. R. Paul, McGraw-Hill, 1930.)

Colour in preservative (75% ethyl alcohol). Dorsal ground colour brownish-red; ventrum as *in vivo*.

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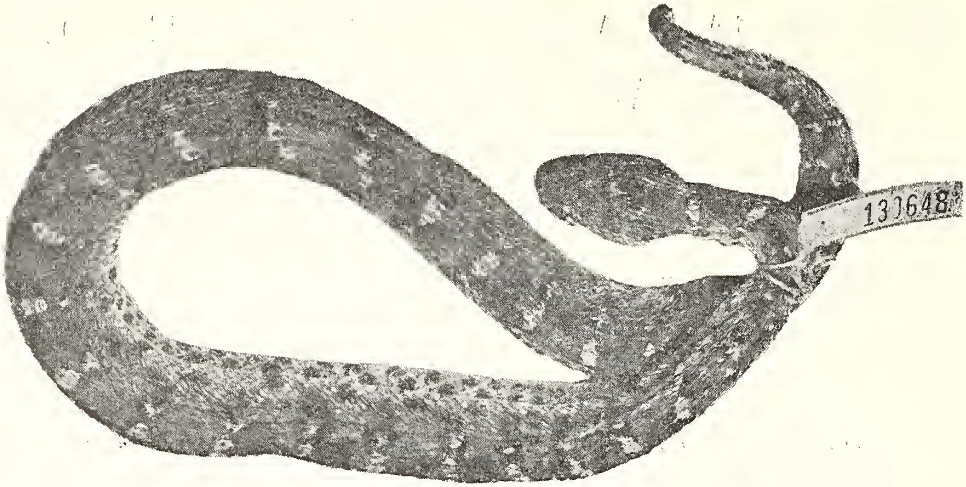


Fig. 1. Holotype of *Echis carinatus aliaborri*, CAS 130648. Photo: Richard B. Hansen.

Pattern. The head is mottled dorsally with two vague median light markings. The anterior mark begins between the posterior limits of the eyes; the posterior mark is directly behind it but unconnected. A reddish brown blotch extends vertically from beneath the eye to the lower jaw; another reddish brown blotch extends diagonally from the posterior base of the eye to the eighth, ninth and tenth lower labials. An oblong dark blotch lies at the symphysis of the jaws. A mid-dorsal longitudinal dark zone, one to two scale rows in width, runs the length of the body. Within the zone, from the nape to above the vent, is a series of 31 irregular ivory spots. Dark reddish brown saddles connect ateral ivory spots to the mid-dorsal spots and outline both. Beneath each lateral ivory

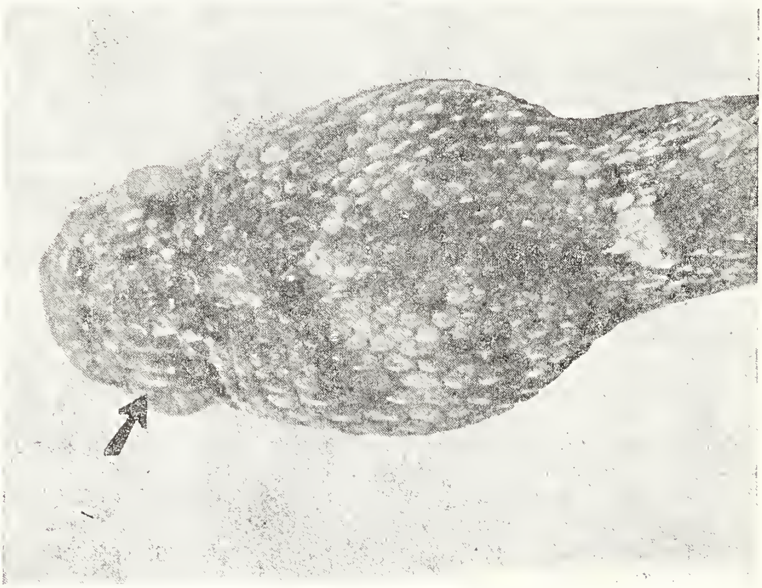


Fig. 2. Close view of head of holotype *Echis carinatus aliaborri* showing enlarged supraoculars. Photo: Richard B. Hansen.

spot is a corresponding dark reddish spot of equal or slightly larger size. Two longitudinal rows of small staggered reddish brown spots run the length of the body at the level of the first and second scale rows.

Variation. The ground colour of CAS 130650, 130651 130653 and 130657 appears slightly darker and browner than that of the holotype. The same is true of CAS 131677, 131678 and 131680 which were not collected and preserved by R.C.D. Pattern on the head varies considerably but is usually made up of two light elements: an anterior "Y", "X" or "λ" and a posterior oblong "T" or cross. The arms of the latter, if distinct, may be elongate and curved caudally although one or the other may be absent or very indistinct. The dorsal pattern varies little except in intensity of colour and number of complete narrow saddles between the nape and beginning of the tail (28–35). Several individuals have incomplete saddles which extend up one side of the body only. Eleven of the paratypes have immaculate venters. Measurements and counts are listed in Table I.

TABLE I

Data on *Echis carinatus aliaborri*

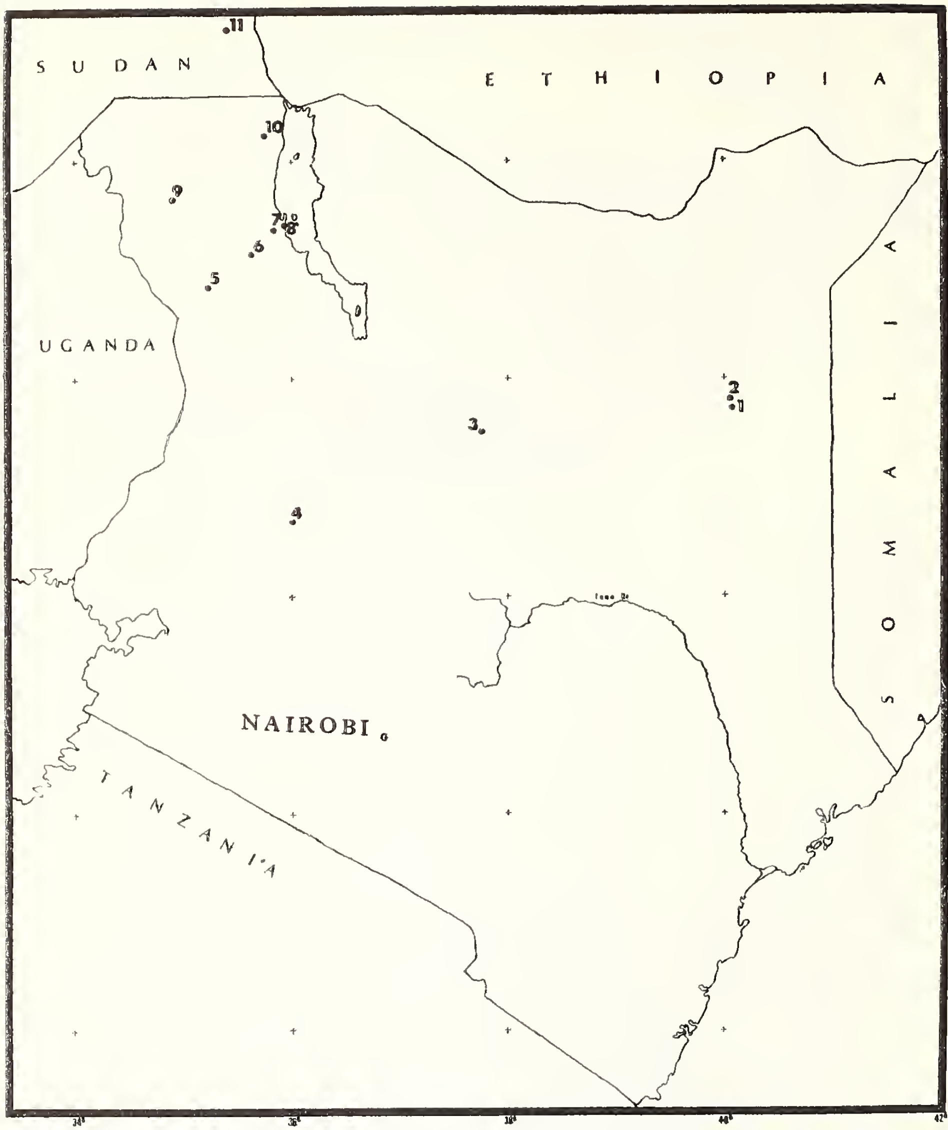
	Total length (mm)	Mid body scale rows	Ventrals	Sub caudals	Scales around eye	Interocular scale rows
♂♂						
CAS 130646	438	29	163	37	15–15	8
130648	419	30	166	36	15–14	8
130650	364	29	163	37	14–13	8
130655	438	30	162	32	14–15	8
130656	468	30	165	38	15–15	7
130658	417	27	162	35	15–16	9
131677	497	30	176	36	15–14	8
131678	507	30	164	35	15–15	7
131679	512	30	166	37	15–14	9
131680	394	29	165	32	16–15	8
♀♀						
130643	410	30	173	33	16–15	9
130644	467	30	182	30	15–14	8
130645	361	31	174	33	13–14	9
130647	451	30	174	34	14–13	9
130649	427	31	178	33	16–16	9
130651	286	30	175	30	14–14	8
130652	469	31	175	32	15–15	9
130653	498	29	181	32	15–15	8
130654	402	29	178	34	13–13	9
130657	378	31	178	35	15–15	9
130662	514	30	172	31	15–15	7

HABITAT

The area north of Wajir from which the holotype and most of the paratypes were taken is characterized by low bushes (cf. *Acacia turnbulliana* Brenan), scattered trees and low outcrops of weathered grey limestone. All specimens collected in this area were found under large limestone rocks against which (after capture) they were quite conspicuous. Of the specimens from Wajir town, CAS 130662 and CAS 131678 were taken under piles of thornbush, CAS 131677 under a dried cowhide, CAS 131679 and CAS 131680 on open sand and in a rock pile respectively.

FOOD

Seven of the vipers from the locality north of Wajir had scorpion remains in their stomachs, and another contained a tail of the scincid *Riopa*. One of the Wajir town specimens contained the remains of a lacertid, probably *Latastia;* another contained a partially digested *Riopa*. We are informed by the collector, Stephen Spawls, that CAS 131680 regurgitated a blind snake (Typhlopidae), similar to *Typhlops cuneirostris* (Peters), a



Map of localities in text. (1) Wajir, Wajir Dist.—01°45′N., 40°04′E; (2) 8 km north of Wajir, Wajir Dist; (3) Moille Hill, Marsabit Dist.—01°31′N., 37°44′E; (4) Kampi-ya-Samaki (Lake Baringo), Baringo Dist.—0°36′N., 36°01′E; (5) Lorugumu, Turkana Dist.—02°56′N., 35°25′E; (6) Lodwar, Turkana Dist.— 03°07′N., 35°36′E; (7) vicinity of Eliye Springs, Turkana Dist; (8) Eliye Springs, Turkana Dist.—03°15′N., 35°57′E; (9) Kakuma, Turkana Dist.—03°43′N., 34°42′E; (10) Lokitaung, Turkana Dist.—04°16′N., 35°45′E; (11) Lokomarinyang, Ilemi Triangle, Sudan—05°02′N., 35°37′E.

Somali form hitherto unknown from Kenya. Although the *Typhlops* was not retained, he caught another at Wajir (CAS 131687) which is at hand, along with six collected by R. C. D. in Mandera, Kenya (CAS 130301–130304, 131681–131682), all identified as T. Cuneirostris (Peters).

DISCUSSION

The various populations of *Echis* in Kenya are poorly known and collections are scarce. Stemmler & Sochurek (1969) described *E. carinatus leakeyi* from Baringo and Moille Hill (see map), comparing their specimens with *E. c. pyramidum* from Egypt only, and suggesting that the range of *leakeyi* is limited to northern Kenya.

During the summer of 1971 R.C.D. collected extensively in northern Kenya, including Turkana District, that portion of Kenya west of Lake Rudolf and north of the type locality of *leakeyi*, an area particularly interesting as it is geographically between the *leakeyi* type locality and Egypt (except for four specimens, we lack material from the Sudan). Therefore, the 62 specimens from Turkana were examined in order to determine whether they were *leakeyi*, *pyramidum* or an intermediate, and thus how they are related to *aliaborri*. Data on the Turkana specimens is summarized in Table 2 with specimens of less than 200 mm total length excluded. Comparison of *pyramidum*, *leakeyi* and *aliaborri* is summarized in Table 3. All data on *pyramidum* were taken from Stemmler & Sochurek (*op. cit.*).

It was found that the populations of *Echis* are virtually the same from Lokomarinyang, Sudan, south to Lake Baringo, Kenya (an approximate distance of 400 km), which would suggest that this form is a fairly recent entrant into Kenya from the northwest, via the Ilemi Corridor (Drewes 1972). In addition, because there is considerable overlapping of characters, it is possible that *leakeyi* may be an extension of *pyramidum*, at the terminus of a cline which extends from Egypt through the Sudan to Kenya. However, it is impossible to speculate further in this regard without material from the Sudan. Thus, until further studies are made we refer the Turkana material to *leakeyi*.

The fact that *aliaborri* is isolated (R.C.D. failed to find *Echis* at Buna, Ramu, Mandera, El Wak, Garba Tula and intervening territory) and is obviously diverging leads us to the conclusion that this population is old and the remnant of a larger group which may have reached Kenya from the northeast, via Somalia.

Although we lack concrete evidence at the moment, we feel that Stemmler & Sochurek erred in including the Moille specimens in the type series in the original *leakeyi* description. While it is impossible to separate the Moille counts and measurements from their description, they cite variations in colour and other parameters which we attribute mostly to the Moille population. Since all the *Echis* we have examined from Turkana District (due north of Lake Baringo, the type locality of *leakeyi*) to the Sudan border are similar, it seems likely that the Moille Hill population is the errant element. We have only three adult specimens (plus one juvenile) from Laisamis (approximately 16 km north of Moille); all are much lighter in colour than any of our material from Turkana, tending towards light yellowish-brown, and differing slightly in counts and measurements. Since Moille, Laisamis and Wajir are east of the Rift Valley, and Turkana District is to the west of it, we suggest the possibility that the Moille/Laisamis group is another remnant of a much earlier Somali expansion like *aliaborri*, and that studies of the group will show that it also is significantly different from *leakeyi*.

TABLE 2

Comparison of *Echis carinatus leakeyi* and *Echis* from Sudan and Turkana District, Kenya

Localities		Mid-body scale rows	Ventrals	Subcaudals	Scales around eye	Inter-ocular scale rows	% enlarged supra-oculars
Lokomarinyang (Sudan)	♂♂	29(1)	161(1)	36(1)	14–15.5–17(3)	8–8.3–9(3)	66.7(3)
	♀♀	29–30–31(2)	172–173.5–175(2)	32–33.5–35(2)			
Lokitaung	♂♂	27–28.3–30(8)	160–165.4–171(8)	34–36–39(8)	12–15.4–19(52)	8–8.3–9(26)	69.2(52)
	♀♀	28–28.5–31(18)	172–175.2–180(18)	28–31.6–35(18)			
Kakuma	♂♂	27–27.4–29(9)	159–163.6–169(9)	32–35.7–41(9)	13–15.6–18(34)	8–8.8–9(17)	35.3(34)
	♀♀	27–28.8–31(8)	169–173.1–181(8)	29–31.5–34(8)			
Near Eliye Springs	♂♂	25–27.7–30(8)	164–169.2–176(8)	34–35.6–37(8)	14–15.8–17(26)	7–8.0–9(13)	42.3(26)
Lodwar	♀♀	25–28–31(5)	173–175.6–179(5)	31–32.6–36(5)			
Lorugumu	♂♂	27–28–29(2)	161–163.5–166(2)	35(2)	14–14.2–15(4)	8(2)	100.0(4)
		27(1)	169(1)	39(1)	15(2)	8(1)	50.0(2)
E.c.leakeyi (Baringo and Moille)	♂♂	25–29.1–31(36)	155–163–176(18)	29–32.4–34.5(18)	11–15–18(74)	7–8.5–11(37)	88.5(52)
	♀♀		167–174–180(18)	27–28.6–31(18)			

TABLE 3

Comparison of three *Echis carinatus* subspecies.

	E. c. aliaborri	*E. c. leakeyi*	*E. c. pyramidum*
Mid-body scale rows	27–29.8–31	25–29.1–31(SS)* 25–28.4–31	26–29.9–32
Ventrals	162–171.0–182	155–168–180(SS) 159–170.6–181	164–175–182
Subcaudals	30–33.9–38	27–30.5–34.5(SS) 28–33.7–44	28–33.3–40
Scales around eye	13–14.5–16	11–14.9–18(SS) 12–15.3–19	14–16.9–19
Upper labials	10–10.4–12	9–10.6–13	10–11.5–13
Interocular scale rows	7–8.3–9	7–8.4–11	7–9.0–10
% enlarged supra-oculars	100	64.3	29.5

*SS = Stemmler & Sochurek specimens, impossible to collate with ours.

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George E. Lindsay and Richard E. Leakey, Directors of the California Academy of Sciences and the National Museums of Kenya respectively, have generously given financial support to the senior author's Kenya field studies. We also wish to thank Alan E. Leviton, of the former institution, for reading the manuscript and making valuable suggestions and A. Duff-MacKay and A. Forbes-Watson, of the latter, for advice and assistance in past years, especially concerning field work.

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EAST AFRICAN BIRD RINGING REPORT 1972-73, 1973-74

By

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This report covers two ringing years, 1st July 1972 to 30th June 1974; no report was prepared for the 1972-73 year because the number of recoveries awaiting publication at that time was very small.

A number of changes have been incorporated in the present report and deserve some explanation. Only Palaearctic species are given in Table 1: in previous years Table 1 was becoming rather long and was beginning to resemble a check-list of East African birds; in the interests of economy, Ethiopian Region species are now omitted. A summary of Ethiopian species ringed is given in Table 2. Table 4 is new and it is hoped will prove useful. It summarises all recoveries received by 18th September 1974 and, for each species, the total number ringed and recovered is given. An examination of the figures in this table will show the almost incredible good fortune East African ringers have had with recoveries to Eurasia, bearing in mind the comparatively small numbers ringed here. The table, and Table 1, will also show that some species, although ringed in fair numbers, have yet to provide a recovery: why should the 1079 Reed Warblers *Acrocephalus scirpaceus* have resulted in two recoveries while the 2224 of the similar Marsh Warbler *A. palustris* have given none? This example is the more surprising since a proportion of the Marsh Warblers must come from Europe where the chances of recovery are greater than in Asia, whereas the East African Reed Warblers are almost certainly all Asian in origin. (The European population of the Marsh Warbler winters in eastern Africa and a Czechoslovakian-ringed Marsh Warbler was controlled in Nairobi in 1971.)

Perhaps the most surprising fact to emerge from Table 4 is that only one East African-ringed bird has ever been recovered in Africa outside Kenya, Tanzania and Uganda—and that, a Little Stint *Calidris minuta*, was controlled by a Belgian ringer in Zaire. Low human population density in Africa and minute numbers of ringers operating in this vast continent are clearly the main reasons for the lack of recoveries. Also, bird killing is not practised widely in sub-Saharan Africa, in contrast to the situation in the Mediterranean area.

The stress given to recoveries, especially distant ones, is often frowned upon nowadays as "non-scientific"; ringing in order to get recoveries is considered by some as a kind of lowly form of sport lacking sound scientific purpose. It must be pointed out to such critics that an enormous amount has still to be learned about the movements of birds—only by marking them individually and getting recoveries can the precise details of these movements become known. To placate the still unconvinced critic I might add that virtually no "ringing-and-flinging" is done in East Africa; many data are collected

when birds are handled for ringing: weights, other physical measurements, moult, ectoparasites and blood films are collected, further, these data are used by East African ringers in papers in the ornithological and parasitological literature.

The bald list of Palaearctic birds retrapped at the ringing site in later seasons has been dropped from this report. A detailed paper on recurrence (*Ortstreue*) in winter quarters is in preparation: this paper will correlate the number of birds ringed and retrapped in subsequent seasons at individual ringing sites.

Very few ringers were operating in East Africa in the two years under review. Most of the waders were ringed by the Backhursts, Duffus' and D. J. Pearson; almost all the hirundines by the Harpers; most of the Palaearctic shrikes, warblers and thrushes by the Backhursts and D. J. Pearson and almost all the Yellow Wagtails *Motacilla flava* by the Backhursts, Duffus' and D. J. Pearson. The Brittons, D. Carthy (1972-73 only), Harpers, A. B. C. Killango (1974 only) and C. F. Mann ringed the bulk of the Ethiopian species while F. B. Gill and his associates ringed most of the sunbirds.

ACKNOWLEDGEMENTS

Ringers gratefully acknowledge the co-operation of the City Engineer, Nairobi for allowing them to operate at Kariobangi Sewage Works; the Director of the Kenya National Parks, Mr. P. M. Olindo, and to Mr. J. M. Mburugu and Mr. E. C. Goss for permission to ring at Lake Nakuru and in Tsavo National Park (West); the Director of Veterinary Services, Kenya, Dr. I. E. Muriithi for permission to ring on certain land at Kabete; to Mr. B. W. Gachihi and Mr. J. N. Hopcraft for allowing ringing on their land at Athi River. The Society is also grateful to the Administrative Director of the National Museums of Kenya, Mr. R. E. F. Leakey, for allowing the Museum's address to appear on the rings.

TABLE 1

PALAEARCTIC BIRDS RINGED BY
THE EAST AFRICA NATURAL HISTORY SOCIETY RINGING ORGANISATION

Species	1972/73	1973/74	Grand total
Ixobrychus minutus Little Bittern	0	0	2
Anas acuta Pintail	1	0	1
A. clypeata Shoveller	0	1	1
A. querquedula Garganey	4	2	22
Circus macrourus Pallid Harrier	0	0	1
Milvus migrans Black Kite	1	0	3
Falco cherrug Saker	0	1	1
F. subbuteo Hobby	0	1	5
Porzana porzana Spotted Crake	2	0	3
Charadrius asiaticus Caspian Plover	0	0	1
C. dubius Little Ringed Plover	1	3	23
C. hiaticula Ringed Plover	18	10	165
C. leschenaultii Greater Sand Plover	0	1	10
C. mongolus Mongolian Sand Plover	0	0	11
Sterna hirundo Common Tern	0	0	1
S. leucoptera White-winged Black Tern	2	2	250
S. nilotica Gull-billed Tern	1	0	9
Phalaropus lobatus Red-necked Phalarope	1	0	4
Arenaria interpres Turnstone	0	2	3
Calidris alba Sanderling	7	2	10
C. ferruginea Curlew Sandpiper	375	222	935
C. minuta Little Stint	2 141	2 009	8 485
C. subminuta Long-toed Stint	0	1	2
C. temminckii Temminck's Stint	4	9	35
Gallinago gallinago Snipe	25	23	147
G. media Great Snipe	0	0	44
G. stenura Pintail Snipe	0	0	1

	1972/73	1973/74	Grand total
Limosa lapponica Bar-tailed Godwit	1	0	1
L. limosa Black-tailed Godwit	0	0	2
Numenius phaeopus Whimbrel	0	0	2
Philomachus pugnax Ruff	383	205	4 411
Tringa erythropus Spotted Redshank	0	0	1
T. glareola Wood Sandpiper	78	87	893
T. hypoleucos Common Sandpiper	22	4	222
T. nebularia Greenshank	53	33	98
T. ochropus Green Sandpiper	1	1	53
T. stagnatilis Marsh Sandpiper	156	66	1 118
T. terek Terek Sandpiper	1	2	10
Cuculus canorus European Cuckoo	0	0	5
Otus scops European Scops Owl	0	1	2
Caprimulgus europaeus European Nightjar	0	0	2
Coracias garrulus European Roller	0	0	4
Merops apiaster European Bee-eater	0	0	1
M. superciliosus persicus Blue-cheeked Bee-eater	0	0	8
Upupa epops European Hoopoe	0	0	1
Jynx torquilla Wryneck	0	0	3
Delichon urbica House Martin	0	15	48
Hirundo rustica European Swallow	227	2 514	9 465
Riparia riparia European Sand Martin	19	265	1 642
Lanius collurio/isabellinus Red-backed and Red-tailed Shrikes	57	—	240 [1961-73]
L. collurio Red-backed Shrike	—	28	28
L. isabellinus Red-tailed Shrike	—	64	64
L. minor Lesser Grey Shrike	0	0	5
L. senator Woodchat Strike	0	0	1
Anthus cervinus Red-throated Pipit	9	2	35
A. trivialis Tree Pipit	29	6	188
Motacilla alba White Wagtail	0	0	5
M. cinerea Grey Wagtail	0	0	2
M. flava Yellow Wagtail	1 887	2 800	33 451
Ficedula hypoleuca Pied Flycatcher	0	0	2
Muscicapa striata Spotted Flycatcher	8	9	72
Acrocephalus arundinaceus Great Reed Warbler	24	12	158
A. griseldis Basra Reed Warbler	36	23	67
A. palustris Marsh Warbler	1 121	883	2 224
A. schoenobaenus Sedge Warbler	279	61	1 685
A. scirpaceus Reed Warbler	118	113	1 079
Hippolais icterina Icterine Warbler	0	0	4
H. languida Upcher's Warbler	16	32	58
H. olivetorum Olive-tree Warbler	13	15	32
H. pallida Olivaceous Warbler	25	18	110
Locustella fluviatilis River Warbler	172	158	359
Phylloscopus collybita Chiffchaff	0	0	3
P. trochilus Willow Warbler	407	198	2 830
Sylvia atricapilla Blackcap	83	43	315
S. borin Garden Warbler	155	79	1 269
S. communis Whitethroat	665	650	1 551
S. nisoria Barred Warbler	39	61	148
Cercotrichas galactotes Rufous Bush Chat	23	14	56
Irania gutturalis White-throated Robin	54	58	126
Luscinia luscinia Sprosser	403	262	808
L. megarhynchos Nightingale	8	24	53
Monticola saxatilis European Rock Thrush	2	2	29
Oenanthe isabellina Isabelline Wheatear	2	1	9
O. oenanthe Wheatear	4	0	46
O. pleschanka Pied Wheatear	0	0	7
Phoenicurus phoenicurus Redstart	0	0	51
Saxicola rubetra Whinchat	1	0	78
Oriolus oriolus Golden Oriole	2	0	14
Total	9 243	11 132	75 707
Number of species	53	52	87

TABLE 2

ETHIOPIAN BIRDS RINGED BY
THE EAST AFRICA NATURAL HISTORY SOCIETY RINGING ORGANIZATION

	1972/73	1973/74	Grand total
Non-passerines	984	658	5 895
Number of non-passerine species	81	62	170
Passerines	3 695	2 323	28 437
Number of passerine species	247	198	371
Total Ethiopian birds ringed	4 679	2 981	34 332
Number of Ethiopian species	328	260	541
Total Ethiopian and Palaearctic birds ringed	13 922	14 113	110 039
Number of Ethiopian and Palaearctic species	381	312	628

TABLE 3

RECOVERIES AND CONTROLS OF BIRDS RINGED IN EAST AFRICA

Key to symbols and terms

Ring number	:	—	where this is in italics the ring has been returned.
Age	: f.g.	—	full grown, age uncertain;
	ad.	—	adult;
	1W	—	bird in its first winter;
	pull.	—	young, not able to fly freely;
	juv.	—	juvenile, able to fly freely.
Sex	: ♂	—	male
	♀	—	female.
Manner of recovery	: +	—	shot or killed by man;
	×	—	found dead or dying;
	xA	—	found long dead;
	/?/	—	manner of recovery unknown;
	v	—	caught or trapped alive and released with ring (control);
	()	—	caught or trapped alive and not released, or released with ring removed.
Date of recovery		—	given in the order: day, month, year. If the date is unknown, the date of the reporting letter is given in parentheses.
Distance (km)	:	—	the Great Circle distance between the ringing and recovery sites, i.e. the shortest distance between these two points.
Elapsed time	:	—	given in the form, years: months: days, thus 1:2:9 signifies that the bird was recovered 1 year 2 months and 9 days after ringing.

Scopus umbretta **Hammerkop**
H 0883 f.g. 21.10.72 Ahero, Kenya 0°11′S., 34°55′E. WEG.
× 1.11.72 Kisumu, Kenya 0°06′S, 34°45′E., 21 km, 0:0:10. Mahesh Raicha.

Threskiornis aethiopica **Sacred Ibis**
D 1825 juv. 3.7.73 Kolal, *c.* 16 km E. of Kisumu, Kenya 0°05′S., 34°52′E. WEG.
+ 0.12.73 Bunyala Location, Busia District, Kenya 0°04′N., 34°02′E., 94 km, *c.* 0:4:27. Kosmos H. Oywolo.

Anas capensis **Cape Wigeon**
D 1043 ad. 24.12.68 Lake Nakuru, Kenya 0°20′S., 36°06′E. PLB & JFH.
v 27.10.73 Lake Hannington, Kenya 0°15′N., 36°06′E., 65 km, 4:10:3. WPHD & DJP.

Anas erythrorhynchus **Red-billed Duck**
Z 0270 ad. 26.11.71 Arusha National Park, Tanzania 3°13′S., 36°54′E. JSSB.
+ (18.6.73) Sanya Juu, Tanzania 3°09′S., 37°01′E., 15 km, *c.* 1:7:22. L. Kapis.

Himantopus himantopus **Black-winged Stilt**
H 1470 f.g. 5.1.72 Lake Nakuru, Kenya 0°20′S., 36°06′E. DJP & JGR.
v 27.10.73 Lake Hannington, Kenya 0°15′N., 36°06′E., 65 km, 1:9:22. WPHD & DJP.

Calidris ferruginea **Curlew Sandpiper**
A 10858 f.g. 1.5.71 Lake Nakuru, Kenya 0°20′S., 36°06′E. DJP.
+ 21.5.74 Uruk, 37 km NE of Samawa, **Iraq** 31°18′N., 45°40′E., 3660 km, 3:0:20. (Dr A. D. Niazi.)

Calidris minuta Little Stint

J 69424	f.g.	13.4.72	Ferguson's Gulf, Lake Rudolf, Kenya 3°31′N., 35°55′E. PLB.
	v	12.5.73	Lake Magadi, Kenya 2°00′S., 36°10′E., 610 km, 1:0:19. DJP.
K 0042	f.g.	14.1.73	Lake Naivasha, Kenya 0°43′S., 36°25′E. WPHD.
	v	3.3.73	Lake Magadi, Kenya, 145 km 0:1:19. WPHD.
K 0536	f.g.	5.5.73	Lake Magadi, Kenya. WPHD & DJP.
	v	5.11.73	Baie de Mwiga, Parc National des Virunga, **Zaire** 0°41′S., 29°23′E., 770 km, 0:6:0. J. P. d'Huart. (Ring replaced with *Mus Brux* IOV 26299)
K 2611	f.g.	20.5.73	Lake Magadi, Kenya. DJP.
	v	27.10.73	Lake Hannington, Kenya 0°15′N., 36°10′E., 250 km, 0:5:7. WPHD & DJP.
K 1402	1W	26.11.73	Lake Naivasha, Kenya. WPHD & DJP.
	v	4.5.74	Lake Nakuru, Kenya, 0°20′S., 36°06′E., 55 km, 0:5:8. JFH.

Philomachus pugnax Ruff

B 5649	ad. ♀	12.4.69	Lake Nakuru, Kenya 0°20′S., 36°06′E. EDS.
	+	16.2.73	*near* Meerut, Uttar Pradesh, **India** *c.* 29°N., 77°40′E, 5490 km, 3:10:4. S.M. Atiq.
B 5837	f.g. ♀	8.11.69	Lake Nakuru, Kenya. GCB.
	v	9.2.74	Lake Hannington, Kenya 0°15′N., 36°06′E., 65 km, 4:3:1. WPHD & DJP.
C 1486	ad. ♂	26.9.70	Lake Nakuru, Kenya. GCB.
	v	25.2.73	Lake Naivasha, Kenya 0°43′S., 36°25′E., 55 km, 2:4:29. GCB.
C 2329	1W ♂	6.11.71	Lake Nakuru, Kenya. GCB.
	v	25.2.73	Lake Naivasha, Kenya, 55 km, 1:3:19. GCB.
B 12836	ad. ♀	20.8.72	Lake Nakuru, Kenya. DJP.
	v	8.12.73	Lake Naivasha, Kenya, 55 km, 1:3:18. WPHD & DJP.

Tringa stagnatilis Marsh Sandpiper

B 11757	f.g.	6.10.73	Lake Magadi, Kenya 2°00′S., 36°10′E. WPHD & DJP.
	v	26.11.73	Lake Naivasha, Kenya 0°43′S., 36°10′E., 145 km, 0:1:20. WPHD & DJP.

Caprimulgus poliocephalus Abyssinian Nightjar

A 12026	f.g.	30.1.70	Kabete, Kenya 1°16′S., 36°43′E. GCB.
	v	17.11.73	Kangemi, Kenya 1°16′S., 36°45′E., 4 km, 2:9:17. J. M. Muiatha.

Colius striatus Speckled Mousebird

B 14671	ad.	8.4.73	Naro Moru, Kenya 0°10′S., 37°01′E. FKV.
	+	(28.3.74)	as above, *c.* 0:11:20. P. Kaskela.

Ceyx picta Pygmy Kingfisher

J 45242	f.g.	28.2.74	Zika Forest, Entebbe, Uganda 0°07′N., 32°28′E. ABCK.
	×	6.3.74	St. Mary's College, Kisubi, Uganda, 2 km, 0:0:6. M. K. Paulus.

Halcyon senegalensis Northern Woodland Kingfisher

B 1658	ad.	27.10.68	Buligi, Murchison Falls National Park, Uganda 2°16′N., 31°23′E. RW & AZ.
	v	7.6.73	Paraa Lodge, Kabalega (= Murchison Falls) National Park, Uganda 2°18′N., 31°35′E., 23 km, 4:7:10. A. Baddokwaya.

Hirundo abyssinica Striped Swallow

J 37749	f.g.	12.7.70	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	v	20.5.73	Muthaiga, Nairobi, Kenya 1°15′S., 36°50′E., 5 km, 2:10:8. G. Lowe.

Hirundo angolensis Uganda Swallow

J 44740	f.g.	29.11.71	Zika, Entebbe, Uganda 0°07′N., 32°28′E. NOO.
	()	27.11.72	St. Mary's College, Kisubi, Uganda, 2 km, 0:11:28. S. C. Kiggundu.

Hirundo rustica **European Swallow**

J 47677	1W	9.3.71	Kibebe Farm, Iringa, Tanzania 7°46′S., 35°42′E. JFR.
	/?/	5.9.73	*near* Akbulak, Orenburg Region, **U.S.S.R.** 51°00′N., 55°31′E., 6800 km, 2:5:26. (Ringing Centre, Moscow.)
J 47749	1W	10.3.71	Kibebe Farm, Iringa, Tanzania. JFR.
	()	17.6.73	*near* Derbent, Dagestan A.S.S.R., **U.S.S.R.** 42°03′N., 48°18′E., 5680 km, 2:3:7. (Ringing Centre, Moscow.).
J 42304	f.g.	18.3.71	Athi River, Kenya 1°26′S., 36°59′E. DJP.
	v	summer 1973	*near* Yangi-Yul', Tashkent Region, Uzbek S.S.R., **U.S.S.R.** 41°10′N., 68°58′E., 5730 km, 2 yr +. (Ringing Centre, Moscow.)
J 45764	f.g.	21.3.71	Athi River, Kenya. DJP
	v	7.10.73	Chokpak Pass, SE Kazakhstan, **U.S.S.R.** 42°31′N., 70°38′E., 5930 km, 2:6:16. Dr E. Gavrilov. (*Moskwa* K-234.214 added.)
J 56173	1W	20.12.71	Lake Nakuru, Kenya 0°20′S., 36°06′E. JFH.
	/?/	17.9.73	Mumias, Kenya 0°20′N., 34°29′E., 195 km, 1:8:27. D. Opwora.
J 87058	ad. ♂	16.3.74	Lake Nakuru, Kenya. JFH.
	v	31.3.74	Lanet, *near* Nakuru, Kenya, 0°18′S., 36°08′E., 5 km, 0:0:15. D. Stoles.
J 87376	ad. ♀	17.3.74	Lake Nakuru, Kenya. JFH.
	/?/	3rd week 4.74	Makareen, *near* Mansuriya, **Iraq** 34°04′N., 44°52′E., 3930 km, 4-5 weeks. (Dr A. D. Niazi.).

Lanius minor **Lesser Grey Shrike**

B 3589	ad.	14.4.69	Maranda, Siaya District, Kenya 0°05′S., 34°13′E. JFH.
	+	29.8.73	South end of Khios, **Greece** 38°13′N., 25°59′E., 4340 km, 4:4:15. A. Synodinos.

Motacilla flava lutea **Eastern Yellow Watgail**

J17255	f.g. ♀	2.10.68	Eastleigh, Nairobi, Kenya 1°16′S., 36°51′E. GCB & MF.
	v	22.9.70	*near* Dzhalilabad, Azerbaijan S.S.R., **U.S.S.R.** 39°15′N., 48°38′E., 4660 km, 1:11:20. (Ringing Centre, Moscow.)
J 71729	1W ♂	28.3.72	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. DJP.
	/?/	(1.12.73)	Najran Town, *near* Dhahran, **Saudi Arabia** *c.* 17°40′N., 44°20′E., 2250 km, *c.* 1:8:0. A.M.F. al Yami.
X 5578	ad. ♂	25.10.72	Kariobangi, Nairobi, Kenya. DJP.
	+	(1.5.73)	Kaha Thakif, Taif, **Saudi Arabia** 21°15′N., 40°21′E., 2530 km, *c.* 6 months. G. Attia.

Acrocephalus scirpaceus **Reed Warbler**

J 67404	f.g.	21.4.72	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	×	2.5.73	Astrakhan' Reserve, Astrakhan Region, **U.S.S.R.** 45°50′N., 47°50′E., 5340 km, 1:0:11. (Ringing Centre, Moscow.)

Phylloscopus trochilus **Willow Warbler**

J 62974	f.g.	4.4.74	Kariobangi, Nairobi, Kenya 1°15′S., 36°53′E. GCB.
	×	26.5.74	Herajarvi, Tuupovaara, (Kuopio), **Finland** 62°34′N., 30°41′E., 7110 km, 0:1:22. Ida Tarvainen.

Sylvia nisoria **Barred Warbler**

A 19053	f.g.	28.11.72	Ngulia Safari Lodge, Tsavo National Park West, Kenya 3°00′S., 38°13′E. GCB.
	+	19.9.73	Al-Meznab (=Al-Midhnab), *near* Unayzah, **Saudi Arabia** 25°55′N., 44°15′E., 3280 km, 0:9:21. M. Abood and R. S. Shamsan.

Ploceus baglafecht reichenowi **Reichenow's Weaver**

A 14355	ad. ♂	1.4.73	Kapsabet, Kenya 0°12′N., 35°06′E. CFM.
	+	*c.* 20.5.73	*presumed* Kapsabet, Kenya, *c.* 0:1:20. The brother of Hosea Rotich.

Ploceus melanocephalus **Yellow-backed Weaver**

A 9739	ad.	10.10.71	Yimbo, Nyanza, Kenya 0°02′S., 34°06′E. JFH.
	×(*cat*)	23.6.73	Yimbo, Kenya, 1:8:13. P. W. Okeyo.

Ploceus ocularis **Spectacled Weaver**

A 5256	ad. ♀	19.9.68	Masindi, Uganda 1°41′N., 31°43′E. FJT.
	+	17.3.74	Masindi, Uganda, 5:5:28. (Game Department.)

Pycnonotus barbatus **Dark-capped Bulbul**

A 13758	ad.	11.4.71	Arusha National Park, Tanzania, *c.* 3°13′S., 36°54′E. JSSB.
	×	0.10.72	Momela Lodge, Arusha National Park, *c.* 1:5:20. (the late L. D. E. F. Vesey-FitzGerald.)

KEY TO INITIALS IN THE LIST OF RECOVERIES

GCB	G.C. & D.E.G. Backhurst
JSSB	*J. S. S. Beesley
PLB	P. L. & H. A. Britton
WPHD	W. P. H. & B. Duffus
MF	*M. Ford
WEG	*†W. E. Grainger, Medical Research Council
JFH	J. F. & L. M. Harper
ABCK	A. B. C. Killango, E. A. Virus Research Institute
CFM	C. F. Mann
NOO	*N. O. Okia, E. A. Virus Research Institute
DJP	D. J. Pearson
JFR	J. F. Reynolds
JGR	*J. G. Rolfe
EDS	*E. D. Steel
FJT	*F. J. Thompson
FKV	*F. K. Vollmers
RW	*R. Wheater
AZ	*A. Zeigler

OTHER RINGERS IN EAST AFRICA

D. J. M. Caffyn; M. Carswell; *D. Carthy (1972-73 only); †M. Goddard; *W. G. Harvey (1972-73 only); *G. Rathbun (1972-73 only); *M. StJ. and G. Sugg (1972-73 only).
*Indicates that these ringers have left the Ringing Organization.
†No schedules have been received from these ringers.

Table 4
SUMMARY OF ALL RECOVERIES OF EAST AFRICAN-RINGED BIRDS

The 110 039 birds ringed in East Africa to 30th June, 1974 have yielded 167 recoveries and controls made up by 72 to foreign countries and 95 within Kenya, Tanzania and Uganda; this number does not include those birds recovered or controlled at the ringing site. Where a recovery is given below as "local", without any distance, it means that when the recovery was notified the finder gave the same locality name as the ringing site; it has been impossible to ascertain exactly how much movement has been involved in these recoveries. The table also omits controls of Yellow Wagtails *Motacilla flava* between roosting and feeding sites and between different roosts in the Nairobi area. Each species entry is treated in the following manner: number ringed to 30th June, 1974; total number recovered; total number of local (i.e. within East Africa) recoveries with distance(s) moved; totals recovered in each foreign country with minimum and maximum Great Circle distances between ringing and recovery sites.

Scopus umbretta Hammerkop 43:1. 1 local, 21 km.
Threskiornis aethiopica Sacred Ibis 7:1. 1 local, 94 km.
Anas capensis Cape Wigeon 437:1. 1 local, 65 km.
Anas erythrorhynchos Red-billed Duck 80:5. 5 local, 15, 15, 15, 19, 20 km.
Anas hottentota Hottentot Teal 182:7. 7 local, 42, 42, 42, 42, 105, 285, 480 km.
Anas undulata Yellow-billed Duck 38:1. 1 local, —.
Fulica cristata Red-knobbed Coot 16:2. 2 local, 290, 390 km.
Charadrius dubius Little Ringed Plover 23:1. 1 **U.S.S.R.,** 4 840 km.
Charadrius hiaticula Ringed Plover 165:1. 1 local, 950 km.
Charadrius pecuarius Kittlitz's Plover 287:1. 1 local, 20 km.
Charadrius tricollaris Three-banded Plover 70:1. 1 local, 55 km.
Himantopus himantopus Black-winged Stilt 190:1. 1 local, 65 km.
Calidris ferruginea Curlew Sandpiper 935:4. 3 local, 185, 185, 185 km; 1 **Iraq,** 3 660 km.
Calidris minuta Little Stint 8 485:7. 6 local, 55, 55, 55, 145, 250, 610 km; 1 **Zaire,** 770 km.
Philomachus pugnax Ruff 4 411:16. 7 local, 55, 55, 55, 55, 65, 65, 110 km; 8 **U.S.S.R.,** 7 540-10 060 km; 1 **India,** 5 490 km.

Tringa glareola Wood Sandpiper 893:3. 3 **U.S.S.R.,** 6 910-7 380 km.
Tringa hypoleucos Common Sandpiper 222:1. 1 **U.S.S.R.,** 6 550 km.
Tringa stagnatilis Marsh Sandpiper 1 118:1. 1 local, 145 km.
Caprimulgus poliocephalus Abyssinian Nightjar 3:1. 1 local, 4 km.
Colius striatus Speckled Mousebird 272:1. 1 local, —.
Ceryle rudis Pied Kingfisher 500:1. 1 local, —.
Ceyx picta Pygmy Kingfisher 339:1. 1 local, 2 km.
Halcyon senegalensis Northern Woodland Kingfisher 21:1. 1 local, 23 km.
Delichon urbica House Martin 48:1. 1 **U.S.S.R.,** 5 130 km.
Hirundo abyssinica Striped Swallow 1 141:9. 9 local, —, —, —, 5, 6, 7, 7, 20, 22 km.
Hirundo angolensis Uganda Swallow 171:1. 1 local, —.
Hirundo daurica Red-rumped Swallow 463:3. 3 local, 8, 8, 240 km.
Hirundo rustica European Swallow 9 465:39. 10 local, —, 5, 13, 27, 46, 90, 135, 160, 195, 365 km; 1 **Germany,** 6 790 km; 1 **Czechoslovakia,** 5 670 km; 1 **Yugoslavia,** 5 250 km; 1 **Bulgaria,** 4 900 km; 1 **Turkey,** 4 560 km; 1 **Lebanon,** 3 800 km; 3 **Iraq,** 3 870-4 080 km; 20 **U.S.S.R.,** 4 660-6 800 km.
Hirundo smithii Wire-tailed Swallow 182:3. 3 local, —, 10, 80 km.
Riparia paludicola African Sand Martin 1 792:3. 3 local, —, —, —.
Riparia riparia European Sand Martin 1 642:1. 1 **U.S.S.R.,** 6 130 km.
Lanius minor Lesser Grey Shrike 5:1. 1 **Greece,** 4 340 km.
Anthus novaeseelandiae Richard's Pipit 108:1. 1 local, 3 km.
Motacilla alba vidua African Pied Wagtail 228:3. 3 local, —, 8, 26 km.
Motacilla flava Yellow Wagtail 33 451:25. 8 local, 5, 8, 30, 30, 30, 45, 215, 300 km; 2 **Saudi Arabia,** 2 260-2 530 km; 1 **Qatar,** 3 390 km; 1 **Iran,** 3 880 km; 13 **U.S.S.R.,** 4 660-7 740 km.
Acrocephalus schoenobaenus Sedge Warbler 1 685:1. 1 **U.S.S.R.,** 5 760 km.
Acrocephalus scirpaceus Reed Warbler 1 079:2. 1 **Saudi Arabia,** 3 180 km; 1 **U.S.S.R.,** 5 340 km.
Phylloscopus trochilus Willow Warbler 2 830:1. 1 **Finland,** 7 110 km.
Sylvia atricapilla Blackcap 315:1. 1 **Iran,** 3 760 km.
Sylvia nisoria Barred Warbler 148:1. 1 **Saudi Arabia,** 3 280 km.
Phoenicurus phoenicurus Redstart 51:1. 1 **Iraq,** 3 790 km.
Nectarinia reichenowi Golden-winged Sunbird 353:1. 1 local, 65 km.
Nectarinia verticalis Green-headed Sunbird 111:1. 1 local, —.
Passer griseus Grey-headed Sparrow 225:3. 3 local, —, 4, 4 km.
Ploceus baglafecht Reichenow's Weaver 351:1. 1 local, —.
Ploceus melanocephalus Yellow-backed Weaver 1 332:1. 1 local, —.
Ploceus nigricollis Black-necked Weaver 77:1. 1 local, —.
Ploceus ocularis Spectacled Weaver 231:1. 1 local, —.
Pycnonotus barbatus Dark-capped Bulbul 1 912:1. 1 local, —.

Table 5
RECOVERIES IN EAST AFRICA OF BIRDS RINGED ABROAD

The signs and symbols are the same as those used in Table 3.

Pelecanus onocrotalus			**White Pelican**
London	pull.	4.5.73	Lake Shala, **Ethiopia** 7°27′N., 38°28′E.
Z 33 . . .	vv	8.8.73	Nderit River, Lake Nakuru, Kenya 0°20′S., 36°05′E., 905 km, 0:3:4. (A sight record of a bird wearing a visual marker.)
Ciconia ciconia	**White Stork**		
Radolfzell *BB 13 971*	pull.	7.6.69	Petrinon, Kaditsa, **Greece** 39°30′N., 22°09′E. H. Heckenroth and R. Helms.
	+	Nov. 1972	15 km W of Arusha, Tanzania 3°21′S., 36°40′E., 4990 km, *c.* 3:6:0. (P. J. Terry and GCB.)
Paris			
A 2748	pull.	4.6.72	Draa ben Khedda, **Algeria** 34°43′N., 3°14′E., G. Fiedler.
	v	16.1.73	Munungа Farm, Mau Narok, Kenya 0°36′S., 36°00′E., 5170 km, 0:7:12. S. Mutua.
	()	10.2.73	Lengetia Farm, Mau Narok, 0:8:6. P. H. B. Sessions. (In both cases the bird was captured from behind a tractor where it had been covered by soil; Mr. Sessions removed the ring before releasing the bird.)
Helgoland *E 4301*	pull.	18.6.72	Brackede, Lüneburg, Niedersachsen, **Germany** 53°21′N., 10°43′E. H. Bieling.
	×	16/17.11.72	Ngofila, Shinyanga, Tanzania 3°55′S., 33°45′E., 6820 km. 0:4:29. (J. Jonathan.)

Helgoland E 5355	pull.	29.6.72	Gräpel, Stade, Niedersachsen, **Germany** 53°34′N., 9°11′E. G. Dahm.
	× ?	28.10.72	Molo, Kenya 0°15′S., 35°44′E., 6 460 km, 0:3:29. J. M. Serem.
Calidris minuta		**Little Stint**	
Pretoria A 93916	ad.	20.2.73	Lake Kariba, **Rhodesia** 17°00′S., 28°00′E. T. Choate & R. Harwin.
	v	6.10.73	Lake Magadi, Kenya 2°00′S., 36°10′E., 1 890 km, 0:7:16. WPHD & DJP.
Philomachus pugnax		**Ruff**	
Pretoria 643-05856	ad. ♂	7.9.72	Barberspan, Delareyville, Transvaal, **South Africa** 26°33′S., 25°36′E. Barberspan Trans. Prov. Admin.
	v	24.4.73	Butiaba, Uganda 1°49′N., 31°19′E., 3 210 km, 0:7:17, released 3 days later. J. Kid-Kisembo.
Ceryle rudis		**Pied Kingfisher**	
London CN 35308	f.g.	21.7.70	Gambela, **Ethiopia** 8°15′N., 34°35′E.
	× (fish net)	0.9.71 *or* 0.11.71	Lake Kyoga, Uganda 1°38′N., 32°48′E., 760 km. S. A. P. Okwir-Opio.
Hirundo rustica		**European Swallow**	
Pretoria A-40598	f.g.	2.2.69	Skinnerspruit, Pretoria, Transvaal, **South Africa** 25°44′S., 28°10′E. H. P. Mendelsohn.
	+	2.10.72	Busia, Kenya 0°28′N., 34°05′E., 2 980 km, 3:8:0. M. Omenda.
Moskwa *K-075.021*	pull.	30.6.72	60 km E of Frunze, Kirghiz S.S.R., **U.S.S.R.** 42°53′N., 75°20′E. (Ringing Centre, Moscow.)
	/?/	end 7.73	25 km E of Busia, Kenya 0°28′N., 34°20′E., 6 230 km, *c.* 1 year. (K. Holt and GCB.)

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ABBREVIATED LARVAL DEVELOPMENT IN THE ALPHEID SHRIMP *RACILIUS COMPRESSUS* PAULSON

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The unusual alpheid shrimp *Racilius compressus* was first described by Paulson in 1875, from specimens from the Red Sea. There were no subsequent reports of the species outside the Red Sea until its rediscovery in Moçambique by Barnard (1955). It has since been reported from Madagascar, East Africa, Thailand, Singapore and Queensland, Australia. It is of widespread occurrence on western Indian Ocean reefs where the normal host coral *Galaxea fasciculatis* L. occurs. No other species have been referred to the genus *Racilius* Paulson. *R. compressus* is note-worthy for its extremely strongly bilaterally compressed body and its association with an oculunid coral, a host not adopted by any other commensal species of the Alpheidae.

Specimens of *Racilius compressus* collected from the coral reefs around Zanzibar Harbour were noted to carry relatively few but large ova, and a female with ova at an advanced stage of development was maintained in sea water until the ova hatched. The first stage was found to hatch with well developed first and second pereiopods and with rudimentary pleopods on all abdominal segments, in a more advanced stage than is typical for the majority of alpheid shrimps. Abbreviated development of larvae has been reported so far in two genera of the Alpheidae, only, *Alpheus* Fabricius and *Synalpheus* Bate, and is an uncommon phenomenon in coral reef Caridea.

DESCRIPTION OF FIRST LARVAL STAGE

The carapace is smooth and without spines. The rostral process is well developed, slender and strongly curved ventrally. The orbital margin is evenly rounded and the antero-lateral angle of the carapace is acute. There are two large oil globules present in the gastric region and a large mass of yolk immediately posteriorly.

The abdomen consists of five distinct subequal segments with the sixth segment fused with the telson. There are no spinous processes on these segments. Small pleural laminae are present on the first five segments, also lacking in any spines. The sixth abdominal segment and telson are equal to three times the length of the fifth segment. The telson is approximately as broad as long and 1.8 times broader posteriorly than anteriorly. The posterior margin consists of two rounded lobes separated by a shallow median notch. Each side of the posterior border bears well developed setae. The sub-median seventh spines are the shortest and the third and fourth, subequal, are the longest. Except for the first, which is setose only on its inner aspect, the posterior marginal setae are densely plumose along their medial and lateral edges. Each seta arises from a distinct marginal tubercle, separated by a deep notch from the adjacent tubercle, and the posterior border of the telson also bears numerous minute setae.

1. Present address: 26 St. Peters Grove, Canterbury, England.

The antennule consists of three segments, of which the first two are robust, the first being half the length of the second. The dorso-medial end of the second segment is lobular and bears a stoutly based, densely plumose seta. The distal segment is more slender than the proximal segments, tapering distally, and equal to about one third of the length of the second segment. It bears distally two filamentous aesthetascs and two short setae.

The antenna has the protopodite indistinctly subdivided into coxopodite and basipodite, both stout unarmed segments, the basipodite about twice the length of the coxodie. The endopodite consists of a short basal segment and a distal segment, about 3.5 times as long, tapering distally and ending in a small spinous process. The exopod is slightly longer than the endopod and without trace of segmentation. The lateral border

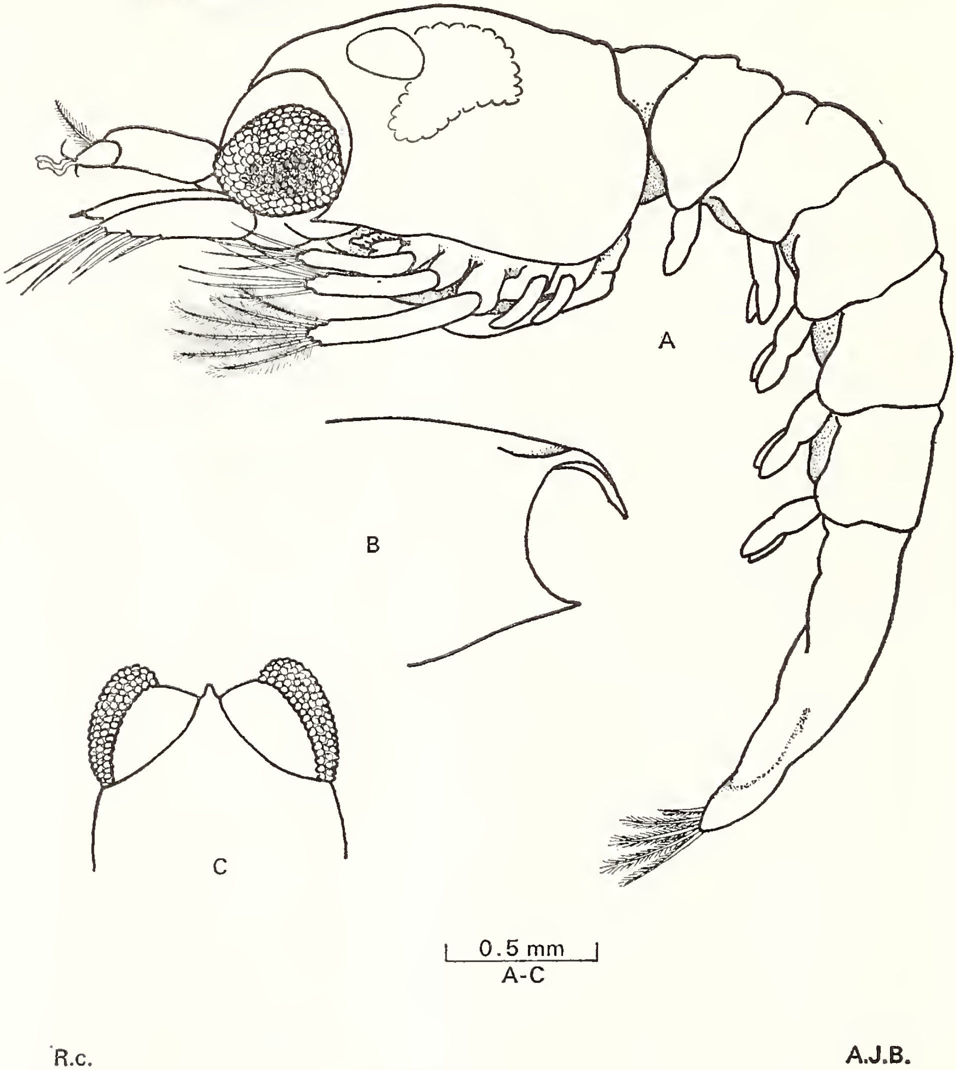

Fig. 1 *Racilius compressus* Paulson: First larval stage (A) Lateral view. (B) anterior carapace, lateral view. (C) anterior carapace and eyes, dorsal view.

bears two short plumose setae and is without spines. The anteromedial border bears nine long, densely plumose segmented setae.

The mandible has the corpus well developed but both molar and incisor portions are feebly developed, with a few small teeth on the molar portion only, and without a lacinia mobilis.

The maxillula is also poorly developed. The upper and lower laciniae consist of two rounded lobes, the former with a small acute process. The palp is present, rounded, and with a slender terminal seta.

The maxilla has a small elongated unsegmented endopod with a short stout plumose seta distally and with numerous very fine setae along the distal and medial border. The basis has a broad rounded distal endite and a smaller narrower proximal endite. Both endites are without setae. The coxal segment has a feebly bilobed medial border. The distal endite is slender with a short simple seta distally and the proximal endite is represented by a low angular non-setose lobe. The scaphognathite is well developed, broader anteriorly than posteriorly and with ten short, broad, densely plumose setae along the lateral margin.

The first maxilliped bears a short unsegmented endopod. The distal end of the endopod tapers to a point bearing a short robust simple seta. Two short and one longer subterminal setae are also present. The exopod is well developed and is provided distally with four long, densely plumose segmented setae. The basal and coxal segments are distinct, broad, and unarmed along their medial borders, except for a minute simple seta proximally on the basis.

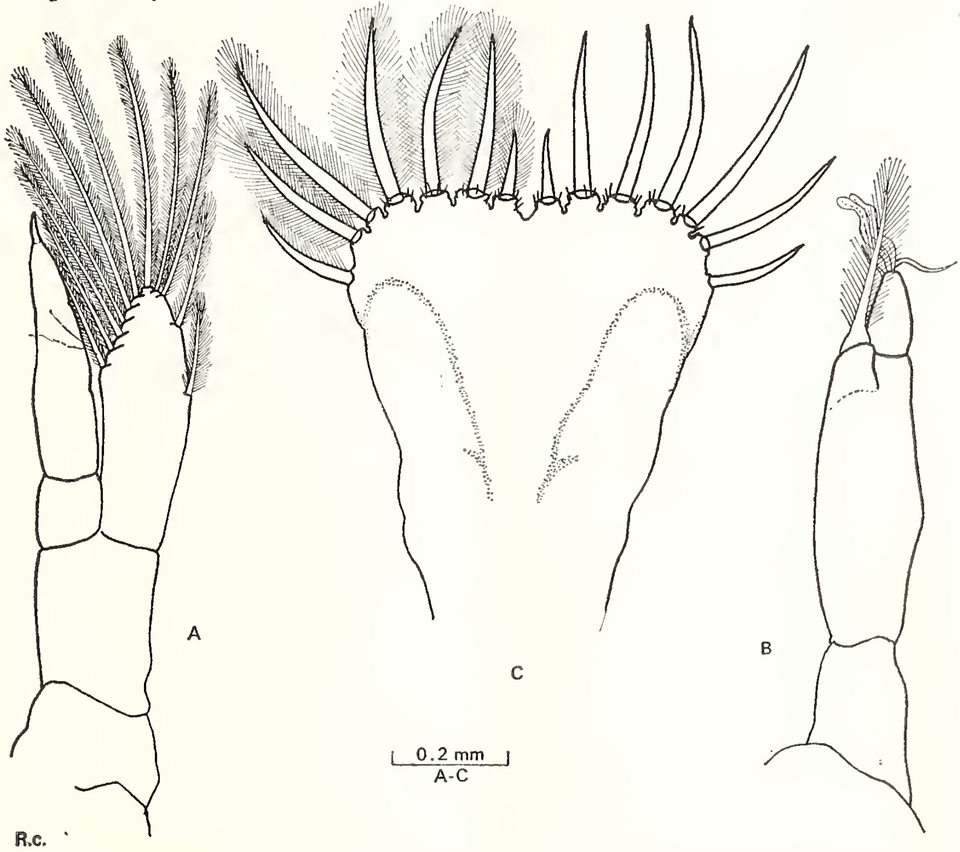

Fig. 2 *Racilius compressus* Paulson: First larval stage. (A) antennule. (B) antenna. (C) telson.

The second maxilliped bears a well developed endopod consisting of four distinct segments. The segments are robust and subcylindrical except for the distal segment, which is tapering and shows indication of division into a small distal dactylar segment and a larger proximal propodal segment. The tip of the dactylar portion bears a stout curved simple seta, with a smaller preterminal seta dorsally. The propodal portion bears a small distoventral seta and a still smaller proximal seta. The carpal segment is the largest segment, about 1.6 times longer than wide, with a strong simple disto-ventral seta. The meral and ischial segments are unarmed, the former being about twice the length of the latter. The exopod is well developed with four long segmented densely plumose setae distally, and with a small simple preterminal seta. The basis and coxa are similar to the first maxilliped.

The third maxilliped has an elongated slender endopod with five distinct subcylindrical segments. The carpal segment is the largest and most robust, and the propod and dactylus taper gradually distally, the latter terminating in a hooked simple seta. The endopod, basis and coxa are similar to those of the first maxilliped, the endopod bearing six plumose setae distally.

The first pereiopods are well developed with the chelae readily distinguishable. The endopod consists of five distinct segments. The dactylus is relatively slender and equal to the length of the palm. The chela exceeds the combined length of carpus, merus and ischium. A short non-setose exopod, subequal to the length of the chela, is also present. The separation between basis and coxa cannot be discerned.

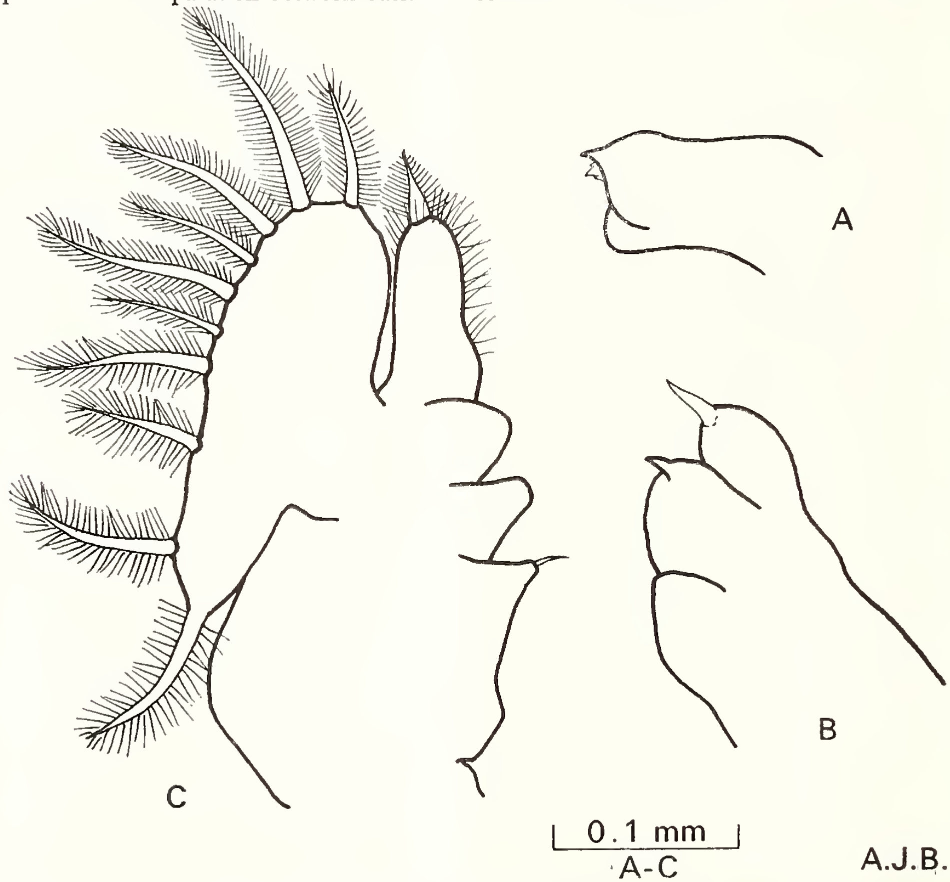

Fig. 3 *Racilius compressus* Paulson: First larval stage. (A) mandible. (B) maxillula. (C) maxilla.

The second pereiopod is similarly developed to the first but shorter and much more slender. The chela is distinct and is equal to about 0.9 of the carpus length. A non-setose endopod is also present and an indication of the separation of the basis and the coxa is also apparent.

Rudiments of the third and fourth pereiopods are clearly visible but are beneath the cuticle and are not free. The fifth pereiopod is well developed and free, and extends forwards along the ventral surface of the body between the second pereiopods. The endopod consists of five distinct, unarmed segments and the separation into basal and coxal segments in feebly indicated. There is no exopod.

Pleopods are present on the first five abdominal segments. The peduncles and rami are distinct. All except the first, are biramous and the rami are non-setose.

There are no free uropods but the uropod rudiments are clearly visible beneath the cuticle of the telson.

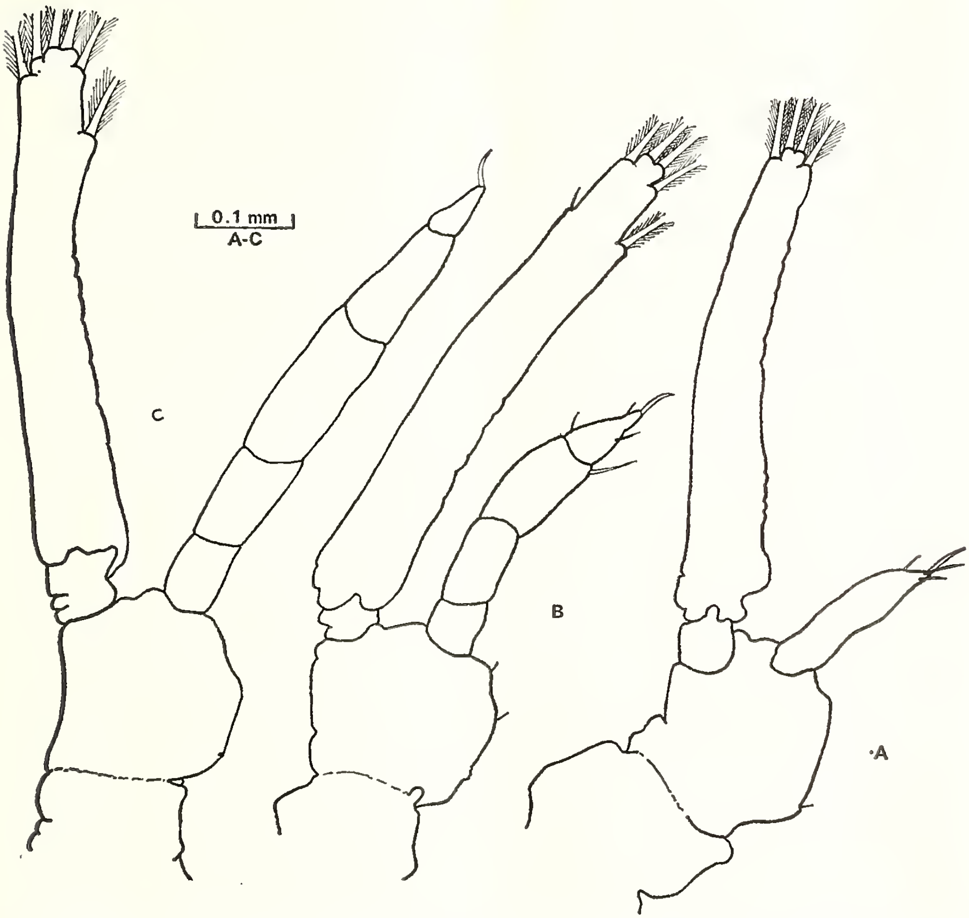

Fig. 4 *Racilius compressus* Paulson: First larval stage. (A) first maxilliped. (B) second maxilliped. (C) third maxilliped.

Measurement: Carapace length, 0.9 mm
Total body length, 3.5 mm

Colouration: Cornea white. Body transparent, with fairly uniformly distributed small yellow-white chromatophores all over, except for the ventral aspect of the abdomen and

the distal halves of the exopods of the maxillipeds. On the abdomen the chromatophores tend to be concentrated into a median dorsal and ventro-lateral longitudinal bands. A few minute red chromatophores were also present around the anterior dorsal region of the carapace, around the base of the rostrum, at the distal median ends of the larger segments of the antennule and antenna, and around the posterior and lateral margins of the telson.

Behaviour: When first hatched the larvae swim actively, head down with the ventral surface of the body uppermost and with the abdomen slightly flexed. Movement is generally by means of the exopods of the maxillipeds, except for sudden backwards escape movements produced by the contraction of the abdominal flexer musculature.

The ovum of *Racilius compressus*

When first laid the ovum is about 1.2 mm, and a typical female will carry about fifteen. When fully developed the ovum measures about 1.4 mm in length.

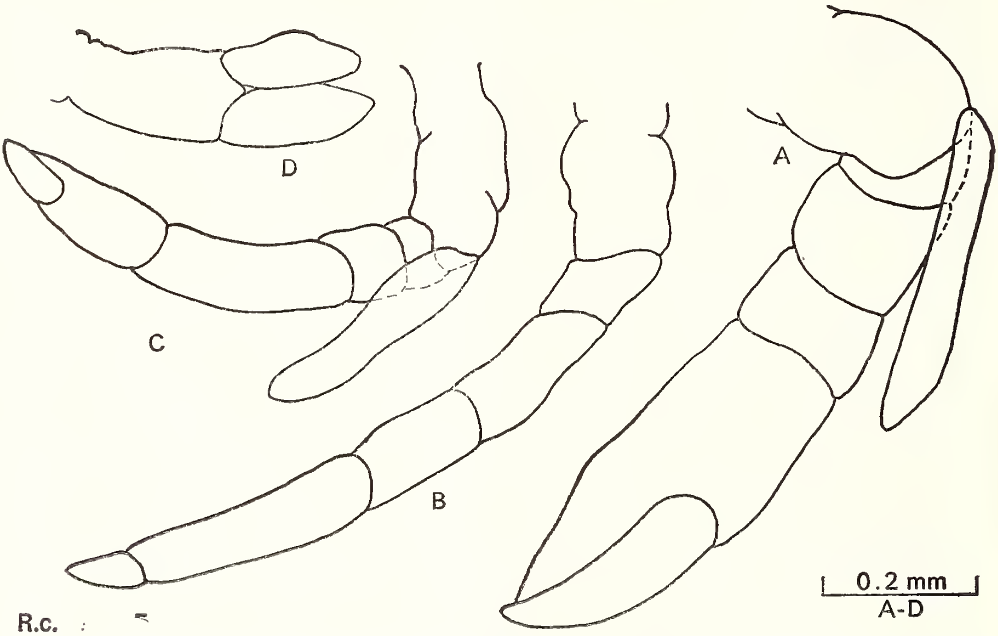

Fig. 5 ***Racilius compressus*** **Paulson: First larval stage. (A) first pereiopod. (B) second pereiopod. (C) fifth pereiopod. (D) third pleopod.**

DISCUSSION

Dobkin has proposed the term "pseudo-larvae" for larvae that hatch out into advanced non-planktonic stages. The first larval stage of *Racilius compressus* is not a pseudo-larva, as has been found in *Synalpheus brooksi* Coutière (Dobkin, 1965). The larva of *Racilius compressus* is a typical representative of the family Alpheidae, as described by Gurney (1939), particularly in reference to the presence of a well developed fifth pereiopod proceeding that of the third and fourth. It shows a closer resemblance to the stage I larva described by Gurney (1949), for *Synalpheus goodei* Coutière than to *S. brooksi*. In some features the larva of *R. compressus* appears more advanced than that of *S. goodei*, while in others it appears in a relatively earlier state of development. The differences may now be outlined, although the full details of the Stage I larval morphology of *S. goodei* have not been given, preventing a complete comparison.

In the *Racilius compressus* first larva the scaphognathite is provided with ten short densely plumose setae distributed along the entire lateral border, whereas in *S. goodei* the scaphognathite is devoid of setae on its posterior extension, and bears only three on its anterior portion. The first pleopod in the *R. compressus* larva is clearly subdivided into peduncle and ramus, and the second to fifth pleopods are distinctly biramous. In *S. goodei* the pleopods are less well developed. They do not show any indication of peduncle and rami, and do not become biramous until the third larval stage is reached. The fifth pereiopod is distinctly segmented. No segmentation is indicated in Gurney's figure for *S. goodei.*

In the *Synalpheus goodei* first larva the antennule has two distal flagellar segments and the development of the three peduncular segments is also clearly indicated in Gurney's figure. The third and fourth pereiopods are apparently free and bear rudimentary non-setose exopods, which are lacking in the *R. compressus* larvae, in which these limbs are not free.

The poorly developed state of the mandible, maxillula and maxilla, when compared to these appendages in early larval stages of alpheid species lacking abbreviated development (Gurney, 1938), indicates that they are probably non-functional. As the thorax of the first larval stage contains two large fat globules and a large mass of yolk, the larva could utilize this nutritional source until after a subsequent moult. The first, second and fifth pereiopods and pleopods, although free are also clearly non-functional and the larva relies upon the exopods of the three pairs of maxillipeds for propulsion during its planktonic phase, which is probably only of short duration.

In a recent review, Dobkin (1969) has summarized the available information concerning abbreviated larval development in the Caridea. Two genera of the Alpheidae, *Alpheus* Fabricius and *Synalpheus* Bate, are known to have shortened larval histories. Both these genera contain large numbers of species but apparently only one of the former and seven of the latter are so far known to have abbreviated larval development, the vast majority of species having a normal type of caridean larval history. The single species of *Alpheus*, *A. heterochaeles* Say, is apparently free-living, but the species of *Synalpheus* are commensals, many of which are to be found living in association with sponges. Like the species of *Synalpheus*, *Racilius compressus* is also a commensal, but found living in association with the oculinid coral *Galaxea fascicularis* (L.). Despite the apparent advantages of shortened larval life histories in commensal shrimps, which might reduce the chances of larvae being unable to locate their appropriate hosts, through being swept into unsuitable habitats by the prevailing water currents, its occurrence, in commensal shrimps and in tropical marine shallow water shrimps generally, is distinctly rare. In fresh water and deep water Caridea it is comparatively common. The faunas of tropical coral reefs are dominated by the Alpheidae and Pontoniinae, a very large proportion of which are known to live in association with other marine invertebrates but in which abbreviated larval development is known so far in only a very few species. Only a single instance is known in the Pontoniinae. *Pontonia minuta* Baker, the host of which is unknown, has been found to have shortened larval development (Bruce, 1972) and would appear to hatch, at a stage approximately equivalent to that of *Racilius compressus* larvae. It is also noteworthy that three other species of pontoniid shrimp that are to be found with *Racilius compressus* in association with *Galaxea fascicularis*, *Platycaris latirostris* Holthuis, *Ischnopontonia lophos* Bruce and *Anapontonia denticauda* Bruce, all produce relatively large numbers of small ova that hatch into a normal stage I pontoniinid larva. Undoubtedly more examples of abbreviated larval development in coral reef Caridea will be discovered but amongst the Caridea that are found in tropical coral reefs, it is distinctly rare.

ACKNOWLEDGEMENT

I am grateful to Dr S. Dobkin for helpful comments upon the draft of this report.

RESUMÉ

Le première stage larvaire de la crevette alpheide *Racilius compressus* Paulson a été écolos d'oeufs obtenus d'une femelle recoltée à Zanzibar. Les oeufs sont grands, et ils n'éclosent qu'a un stage avancé, avec trois paires de pereiopodes et cinq paires de pleopodes bien developés mais non-fonctionels. La larve ressemble de pres celle de *Synalpheus goodei*, à laquelle elle est comparée. La rareté de development larval abregé chez les Carides des recifs de corail tropicaux est notée.

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PRELIMINARY CHECKLIST OF THE FISHES OF THE SOUTH BANK, KILIFI CREEK, KENYA

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The area surveyed lies at the eastern (Indian Ocean) end of Kilifi Creek; only species occurring on the southern bank were recorded. Observations were made between the Mnarani Club jetty and Ras Kitoka (fig. 1) and were confined to the area between high water mark and a depth of approximately 3 metres down the steeply sloping shelf which marks the edge of the Kilifi Creek channel (30 metres depth). The width of this shallow strip varies from 2 to 10 metres.

Within the area are 6 distinct ecological habitats:

(1) Around fish traps, where the closely-set stakes and rocks afford good protective cover for many species.

(2) Shallow areas of the creek between high water mark and the deep water channel with a *sandy* bottom, in places supporting sparse stands of *Cymodocea* and other marine grasses.

(3) Shallow areas with a rocky bed, in places with rocky debris or supporting small formations of corals, mainly *Porites*, *Acropora* or *Favia*.

(4) A zone at the mouth of the creek, parallel to the shore line, characterised by massive heads of *Porites* up to 3 metres diameter which support colonies of *Acropora*, gorgonians and algae (*Sargassum*). The deep water channel is to the immediate seaward side of this zone.

(5) Dense *Cymodocea* meadows to the leeward side of the *Porites* zone, in depths of water varying from a few centimetres to approximately 2 metres at low water.

(6) Rocky, shore-line pools on old, raised eroded coral platform. These habitats are indicated diagrammatically in fig. 2. In addition, there are areas between the *Porites* heads with a profusion of giant sea anemones (*Radianthus*) which form specialised habitats for species of *Amphiprion*.

The most marked feature of the waters of the creek banks is the amount of fine sediment and particulate matter which forms a thick covering over much of the bed and coats corals and other static animals and objects. It is easily stirred into suspension and, although always present, is more noticeable during the south-east monsoon; the waters are often very clear on incoming tides in the north-east monsoon. Nonetheless, any

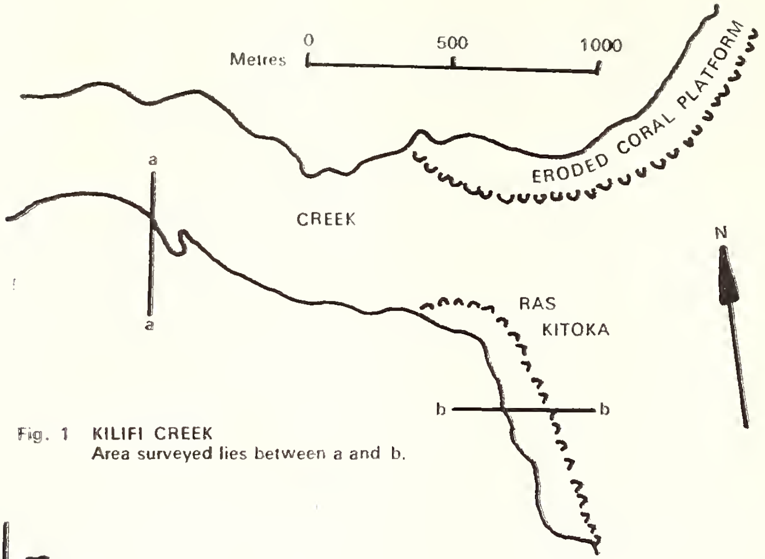

Fig. 1 KILIFI CREEK
Area surveyed lies between a and b.

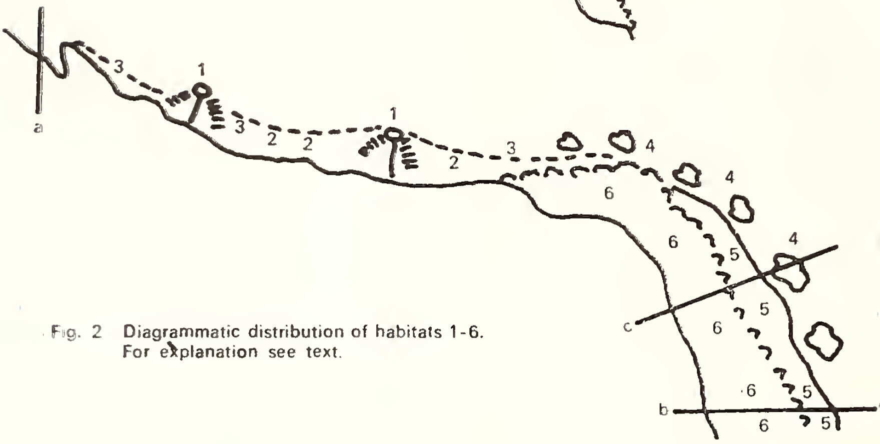

Fig. 2 Diagrammatic distribution of habitats 1-6.
For explanation see text.

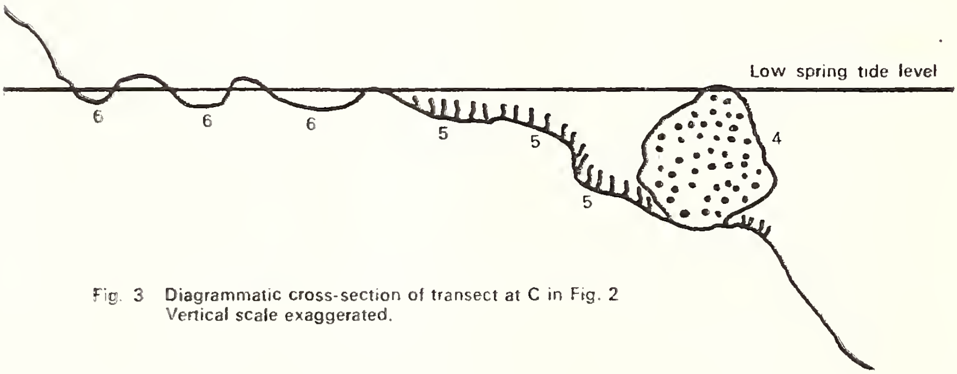

Fig. 3 Diagrammatic cross-section of transect at C in Fig. 2
Vertical scale exaggerated.

species living and breeding in the creek must be tolerant of fine sediments. Although this factor obviously plays a part in determining the coral species present (principally *Porites*, a genus noted for its capacity to withstand sediment), the number of species of fish more normally associated with clear lagoon or reef waters is surprising.

Recordings were made during August, 1971, July/August, 1972, December, 1972 and April, 1973. With few exceptions, identification was by underwater observation only, and this occasionally presented obvious problems in identity.

While the checklist can only be described as preliminary, several differences in species distribution and densities are apparent between lagoons of the shallow type such as Diani (Bock, 1972) and the Kenya creeks. The most noticeable of these is the number of different species and comparatively high frequency of occurrence of the Tetraodontidae. The quiet, turbid waters of the creek seem particularly favourable to the genus *Arothron*. This seems to contrast with the Balistidae, at least one species of which (*Rhinacanthus aculeatus*) is common in the shallow lagoons: it is either very rare or absent in the creek habitats.

The genus *Coris* is well-represented in the shallow lagoons, juveniles and adults of at least four species being common. A single record of *C. formosa* was made in Kilifi Creek.

Abudefduf dicki is common among the *Porites* heads at Kilifi, but was never observed at Diani, suggesting perhaps a discontinuous distribution of this species of the Pomacentridae. While there is no apparent reason why this species should not occur at Diani, the probable absence of species such as *A. xanthozonus* and a general lack of members of the Serranidae, Gobiidae, Blennidae and Salariidae is attributable simply to the lack of favourable habitats in the creek.

The closely-set stakes of the fish traps form an ideal habitat for *Siderea grisea*: the population density of this moray eel is high and groups of them (often as many as 5 or 6) are common around the traps. Over one-third of the total of 121 species were observed among the stakes, an indication of the vital role any form of protective cover plays in an area lacking extensive coral formations.

Most species occurred commonly in that they were observed on all or nearly all occasions, and on each successive visit to the area. Only those encountered either abundantly or frequently are noted in the list.

This paper is the second in a series of preliminary checklists which will compare differences in habitats and associated fish fauna of the shallow lagoons (Bock, 1972), deep water lagoons, creeks and mangrove forests of the Kenya coast.

In the checklist, the numbers entered after the species refer to the numbers given to the habitats (fig. 2) in which the species were observed.

The abbreviated author citations for species were taken from Smith & Smith (1963).

CLUPEIDAE (Sardines)
Sardinella melanura (C & V) surface waters of creek, in shoals

PLOTOSIDAE (Barbel Eels)
Plotosus arab Blkr 2, 3, 5, juveniles only, in compact shoals

SYNODIDAE (Lizardfish)
Synodus variegatus (Lac) 2

HEMIRAMPHIDAE (Halfbeaks)
Hemiramphus sp surface waters of creek, in shoals
Hyphoramphus dussumieri (C & V) surface waters of creek, in shoals

BELONIDAE (Garfish)
Tylosurus crocodilus (Le Sueur) surface waters of creek, in small shoals, and at 4

BOTHIDAE (Flatfish)
Pardachirus marmoratus (Lac) 2, uncommon

SYNGNATHIDAE (Pipefish and Seahorses)
Corythoichthys fasciatus (Gray) 1, 3
Doryramphus melanopleura (Blkr) 1, uncommon
Hippocampus sp. uncommon

FISTULARIIDAE (Flutemouths)
Fistularia petimba (Lac) 1, 3

CENTRISCIDAE (Razorfish)
Aeoliscus strigatus Gnthr 1, 3

CIRRHITIDAE (Hawkfish)
Cirrhitichthys oxycephalus (Blkr) 1
Paracirrhites forsteri (Bl-Schn) 4, on coral

TERAPONIDAE (Thornheads or Jarbuas)
Terapon jarbua (Forsk) 6

SERRANIDAE (Rock Cod)
Grammistes sexlineatus (Thunb) 1
Epinephelus tauvina (Forsk) 1, 3

APOGONIDAE
Apogonichthyoides nigripinnis (C & V) 1
Cheilodipterus artus Smith 1
Ostorhinchus fleurieu Lac 1, 4
Ostorhinchus savayensis (Gnthr) 1, 3
Paramia quinquelineata (C & V) 1

CARANGIDAE (Kole kole)
Caranx malabaricus (Bl-Schn) creek waters, in shoals
Chorinemus tolooparah (Rupp) creek waters, in shoals
Selar crumenophthalmus (Bloch) creek waters, in shoals

MULLIDAE (Red Mullets)
Pseudupeneus macronema (Lac) 2, juveniles only
Upeneus tragula (Richdsn) 2

PLATACIDAE (Batfish)
Platax pinnatus (Linn) 1, 2, 3

POMACANTHIDAE (Angelfish)
Centropyge multispinis (Plfr) 4
Pomacanthodes striatus (Rupp) 3, 4
Pomacanthops semicirculatus (C & V) 4

CHAETODONIIDAE (Butterflyfish)
Chaetodon auriga Forsk 1, 3, 4
Chaetodon falcula Bloch 4
Chaetodon lineolatus C & V 4
Chaetodon lunula (Lac) 1, 3
Chaetodon trifasciatus Mungo Park 4
Chaetodon unimaculatus Bloch 4
Chaetodon zanzibarensis Plfr 4, uncommon
Heniochus acuminatus (Linn) 1, 3

ACANTHURIDAE (Surgeon or Lance fish)
Acanthurus leucosternon (Benn) 4
Acanthurus lineatus Linn 4
Acanthurus triostegus (Linn) 6
Acathurus sp. 1
Zebrasoma flavescens (Benn) 4
Zebrasoma veliferum (Bloch) 4

ZANCLIDAE (Moorish Idols)
Zanclus cornutus (Linn) 4

GERRIDAE
Gerres oyena (Forsk) 2, 3

KYPHOSIDAE (Rudderfish)
Kyphosus vaigiensis (Q & G) 2, 3

PEMPHERIDAE (Sweepers)
Pempheris oualensis (C & V) 1, in shoals

LUTJANIDAE (Snappers)
Lutjanus johni (Bloch) 1, 2, 3
Lutjanus kasmira (Forsk) 1, 2, 3
Lutjanus sebae (C & V) 2, juveniles among sea urchin spines, uncommon

CAESIODIDAE
Caesio caerulaureus Lac 1, 4, in small shoals

GATERINIDAE
Gaterin flavomaculatus (Ehren) 4
Gaterin gaterinus (Forsk) 4
Gaterin playfairi (Pell) 2, 4
Gaterin punctatissimus (Plfr) 4

LETHRINIDAE (Barefaces)
Lethrinus harak (Forsk) 2

POMACENTRIDAE (Coral or Damsel fish)
Abudefduf biocellatus (Q & G) 6
Abudefduf dicki (Linn) 4
Abudefduf lachrymatus (Q & G) 4
Abudefduf saxatilis (Linn) 1, 4
Abudefduf septemfasciatus (C & V) 1, 4, 6
Abudefduf sexfasciatus (Lac) 1
Abudefduf sparoides (C & V) 1, 4
Amphiprion akallopisos Blkr 4
Amphiprion ephippium (Bloch) 3, 4
Chromis caeruleus (C & V) 4, juveniles in small shoals, always near coral
Chromis dimidiatus (Klunz) 4
Chromis nigrurus Smith 1, 4
Dascyllus aruanus (Linn) 3, 4
Dascyllus reticulatus (Richdsn) 4
Dascyllus trimaculatus (Rupp) 3, 4, juveniles among Sarcophyton, 2
Pomacentrus pulcherrimus Smith 3, 4
Pomacentrus sulfureus Klunz 4
Pomacentrus taeniurus Blkr 1, 4

LABRIDAE (Wrasses or Rainbowfish)
Anampses caerulopunctatus Rupp 4
Cheilinus trilobatus Lac 4
Coris formosa Benn 4, adult, one record only
Gomphosus varius Lac 4
Halichoeres marginatus Rupp 4
Labroides bicolor Fwlr 4
Labroides dimidiatus (C & V) 1, 3, 4, 6
Lepidoplois sp 4
Thalassoma amblycephalus Blkr 4
Thalassoma lunare (Linn) 1, 3

SCARIDAE (Parrotfish)
Scarus apridentatus (Smith) 3, 4
Scarus frenatus Lac 4
Xanothon venosus (C & V) 4

SCOMBEROMORIDAE (Kingfish)
Scomberomorus guttatus (Bl-Schn)

MUGILIDAE (Grey Mullet)
Mugil buchanani Blkr 2, 3 deeper water

SPHYRAENIDAE (Barracuda)
Sphyraena barracuda (Walb) 1, 2, 4, 5, juveniles only, in small shoals

SIGANIDAE (Rabbitfish)
Siganus oramin (Bl-Schn) 5

ELEOTRIDAE
Ptereleotris tricolor Smith 4, one record only

ECHENEIDAE
Echeneis naucrates (Linn) one record only; attached to green turtle

BLENNIDAE (Blennies)
Meiacanthus mossambicus Smith 1
Runula rhinorhynchos (Blkr) 4

SCORPAENIDAE (Scorpionfish)
Dendrochirus zebrae (C & V) 1, 3
Pterois volitans (Linn) 1, 3
Pteropterus antennata (Bloch) 1, 3
Scorpaenodes ?guamensis (Q & G) 1, 3

SYNANCEJIDAE (Stonefish)
Synaceichthys verrucosus (Bl-Schn) 3

CEPHALACANTHIDAE (Flying Gurnards)
Dactyloptena orientalis (C & V) 2

MURAENIDAE (Moray Eels)
Lycodontis undulatus (Lac) 1, 3
Siderea grisea (Lac) 1, 3, abundant

MONACANTHIDAE (Filefish)
Amanses sp 2
Oxymonacanthus longirostris 4

ALUTERIDAE
Osbeckia scripta (Osbeck) 2, uncommon

OSTRACIIDAE (Boxfish, Cowfish)
Lactoria cornuta (Linn) 2, 3
Ostracion tuberculatus (Linn) 1, 2

DIODONTIDAE (Porcupinefish)
Diodon hystrix Linn 1, 2, 3
TETRAODONTIDAE (Puffers)
Arothron aerostaticus (Jenyns) 2, uncommon
Arothron hispidus (Lac) 2, 3
Arothron immaculatus (Bl-Schn) 2, 3, 4
Arothron nigropunctatus (Bl-Schn) 2, 3
Arothron stellatus (Bl-Schn) 2, 3, 4

CANTHIGASTERIDAE (Sharpnosed Puffers)
Canthigaster bennettii (Blkr) 1, 3
Canthigaster janthinopterus (Blkr) 1, 3
Canthigaster valentini (Blkr) 1, 3

ANTENNARIIDAE
Antennarius sp 1, uncommon
DASYATIDAE (Stingrays)
Dasyatis sp 2

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A GUIDE TO THE SNAKES OF THE TANZANIA AND KENYA BORDERLANDS

By

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A GUIDE TO THE SNAKES OF THE TANZANIA AND KENYA BORDER-LANDS

INTRODUCTION

This paper sets out to give an account of the common snakes of East Africa. Hopefully, it will stimulate an interest in these remarkable reptiles which should be respected, but not feared, and certainly not destroyed on sight without compassion, or comprehension of their extraordinary way of life.

It is nearly 50 years since our Society published the first list of East African Snakes, Loveridge (1924). At that time, 54 genera containing 138 species were recorded from the four territories, Uganda, Kenya, Tanganyika and Zanzibar. The latest East African checklist records 55 genera and 125 full species, Loveridge (1957).

As the distribution and geographical variation of the different species becomes better understood, it is expected that the number of species in each genus will be further reduced, although new subspecies may be discovered.

I have selected, for my present account, the kinds of snakes likely to be seen in the more populated parts of the Kenya and Tanzania upland areas, including the most popular National Parks near the border of the two countries. These are, in effect, the common snakes of East Africa.

This selection excludes a number of western genera which occur towards the Uganda and Lake Tanganyika borderlands. These are: *Boiga*, *Bothrophthalmus*, *Boulengerina*, *Dipsadoboa*, *Dromophis*, *Gastropyxis*, *Grayia*, *Hapsidophyrs*, *Hormonotus*, *Lycodonomorphus*, *Miodon* and *Pseudohaje*.

Also omitted are dry-country and coastal genera, such as *Chamaetortus*, *Coluber*, *Echis*, *Eryx* and the Sea-snake *Pelamis*. The snake faunas of Tsavo and Serengeti National Parks are therefore not fully treated in this account. Several little-known (mainly burrowing) snakes have also been left out, as they have not been collected, as far as I know, in our area. These are: *Amblyodipsas*, *Calamelaps*, *Chilorhinophis*, *Geodipsas*, *Micrelaps* and *Rhinocalamus*.

This leaves 32 genera and some 41 species, which have been found, or are likely to be found in the general vicinity of Nairobi and Arusha. The area treated lies above the approximate 1000 m altitude and has a rainfall probability of between 600-1300 mm. The natural vegetation was mainly forest, now forest remnants with extensive cultivation. Marginally, there are deciduous woodlands where the characteristic trees include *Acacia*, *Combretum* and *Commiphora*. These have been extensively degraded by over-burning and, in part, by over-grazing. Secondary grasslands now cover extensive areas and edaphic grassland exists in the drainage lines.

It is rather difficult to decide which are the common snakes that one should get to know. Even for a resident of these countries, finding a snake is usually quite an excitement. Visitors are likely to finish their tour without seeing one at all. This is not because snakes are few; it is because they are extremely secretive creatures which are easily overlooked.

Several species are, in fact, widespread and have a habit of turning up unexpectedly in the garden, or even indoors. It is impossible to believe that these can really be so rare and yet survive over such a wide area and in such unexpected places. They must be about all the time. It is nice, therefore, to know them when you meet them, so as to be able to respect the dangerous ones and spare those that are harmless.

Also, one has a very good chance of learning something new. In this connection, I would like to stress that any smallish, burrowing snake is sure to be of interest. It is among this group that discoveries are likely to be made. Any found should be collected and sent to the Museum for identification.

HOW TO EXAMINE A SNAKE

It is perhaps hardly necessary to say that no one should take risks with an unknown snake. This usually means that the specimen has to be killed before it can be examined in detail. A smart rap with a stick, or a shot in the middle of the back is usually the most effective method of doing this.

Small snakes can be very quickly killed by putting a feather smeared with nicotine from a pipe into their mouths. Most specimens brought in have usually had their heads badly bashed and, as this makes identification very difficult, it is a method of destruction which must be discouraged among would-be collectors. One can usually tell when a snake is properly dead by lying it on its back. If there is any life left in it, it will roll over onto its front again. In South Africa, we are told, there is a snake—the Rinkhals—which shams death by performing this trick!

The most important things to examine on a snake are, of course, the fangs. These will be obvious in a big viper, or cobra, and, needless to say, the observer should be careful not to prick his finger with the fangs of a freshly-killed snake. With small snakes, however, it will be difficult to differentiate between fangs and ordinary teeth. Indeed, a needle and a magnifying glass are necessary in order to see any teeth at all in the mouth of a very small snake. For this reason, it is not always convenient to rely on the presence or absence, and the position of the fangs, in identification. Nevertheless, as snakes are classified on the character of their teeth, it is necessary to know something about them.

Leaving, for the moment, the blind-snakes, worm-snakes, the python and the toothless egg-eater, the remaining snakes are divided into four groups.

Group one contains the harmless snakes which have no poison fangs, but have many needle-like, backwardly directed teeth in their mouth. These teeth are usually all more or less the same length.

The second group contains the back-fanged snakes, which are poisonous. Most of these species are too small to harm a human being; but others, the bigger ones, are dangerous, though the chances of their inflicting a bite are rather remote. The fangs of these snakes must be sought in the upper jaw, just behind the eyes. They can be recognised as somewhat longer and stronger teeth among the others. Feeling around with a pin will usually show them up. It must be emphasised, however, that the fangs—especially of small snakes—are quite easily overlooked. Some back-fanged snakes will be found which have large teeth in front of the eyes as well as behind. The forward teeth, however, are not the poison fangs, and such an arrangement of uneven length teeth is quite a good spot for recognising the various sand-snakes.

The third group covers the front-fanged snakes, the dangerous mambas and cobras. The fixed, peg-like fangs in front of the upper jaw are usually quite easily seen although they may be partly hidden in a sort of fleshy gum which, however, can be pushed down with a needle.

In the last group, the vipers, fangs are long and moveable, set near the front of the upper jaw. They are usually quite easy to see, and will be found lying back against the roof of the mouth; they can be moved up and down with a pin.

If the examination of the teeth yields a positive result, one is well on the way to identifying the snake. If no fangs can be seen with certainty, other characteristics about the snake must be looked for, and noted.

The first thing anybody asks about a snake is what is its length. Measure the snake, straightened out, but not unduly stretched, from the snout to the tip of the tail.

If one turns a snake over onto its back, it will usually be seen that there is a series of traverse scales along the underside of the body, from the neck backwards. If, however, the scales of the belly are like the scales of the back, it is a good spot for recognising the blind-snakes and worm-snakes. In all the other snakes, the traverse scales continue towards the tail until they reach a D-shaped scale which is like a flap. Note whether this special scale is divided or entire. Underneath and behind this anal scale, the opening of

the vent will be seen. This is the end of the body, and the rest of the snake is tail. Make a note of the separate lengths of the body and tail. In the text the length of a full-grown adult specimen is given in millimetres; then, in brackets, the length of the body and tail separately.

The ventral scales—those along the belly—should be counted, because their number helps in identification. The number will not be exactly the same in all specimens, but the range is meaningful. The counts given in the description of each species are those found on specimens which have been examined.

The scales under the tail will be seen to be paired. If they are not paired, by any chance, but are single (like the scales under the belly), make a note of the fact. This characteristic is important in the identification of some rather unusual species of snakes. Count the subcaudal scales, especially noting if the tip of the tail appears to be damaged.

Next, count the number of scales round the middle of the body. The number is an important characteristic for identification. Some people may find scale-counting tedious; but it is worth learning how to do it. Select an undamaged portion about the middle of the body, and, starting from the edge of one of the belly scales, count the rows of scales up the side and over the back to the edge of the belly scale on the opposite side see fig. 7. Note the number of scales.

Next, look at the head. Consider its shape, and the form of the neck. Memorising these details will be useful in recognising the same kind of snake next time. Note if the pupil of the eye is round or oval. Round-eyed snakes are usually diurnal and oval-eyed snakes nocturnal. If the pupil is horizontally elongated, it is the mark of the Vine-snake, which in any case is easily recognised, see fig. 19.

The details of the scales on the head are also important. The names of the different scales (and those which should be examined and counted for purposes of identification) are illustrated and referred to in the key and the descriptions of the species.

Naturally, the observer will take note of the colour-pattern of the snake. In many cases, this will enable the species to be recognised at once, but at other times it can be most misleading. There are many kinds of snakes which vary very much in colour and pattern; so that extreme forms can hardly be recognised as belonging to the same species. Then again, there are several quite different snakes which closely resemble each other in markings. Lastly, there are several small blackish snakes, both harmless and piosonous, which all look very alike.

A difficulty arises over young individuals of some species, because they may have a colour pattern very different from that of the adults. Indeed, several kinds have a very distinct pattern when young, whereas adults of the same kind may be unornamented. When applicable, distinct juvenile patterns are noted in the text.

Newly-born, or recently-hatched, snakes can be recognised by the umbilical scar. This will be found along a few of the ventral scales, a short distance up the belly from the vent. The scar looks like a tiny slit made by a razor blade. If it is present, it is a sure sign that the snake is very young.

To "sex" a snake is easy. Lie the specimen on its back and put your thumbs one on each side of the vent, one placed at the base of the body, the other at the root of the tail. Now apply slight rolling pressure. At the same time, press the thumbs gently towards one another so as to extrude the vent. If the snake is a male, two fleshy, horn-like objects will pop out, at each side of the vent. In the case of a female, the circular orifice of the vent is all that is seen. In the case of large snakes it is usually easier to detect the male organs by probing with a blunt needle backwards at the base of the tail, on either side of the vent. The two cavities from which the horns can be made to protrude are easily found in this way. Tails of male snakes are usually longer than those of females, see figs. 2a and 2b.

THE KEY

1. Snakes in which head and tail ends are, on casual inspection, indistinguishable; mouth very small; eyes not evident; tail very short and stumpy. Sometimes small worm-like creatures; scales small, close set and of similar type all round body, photos i and ii. Typhlopidae and Leptotyphlopidae

Snakes of normal appearance; head, eyes, mouth and tail apparent; body scales of three types, those on back and sides arranged rather like tiles on a roof, along the belly they form traverse scutes, under the tail they are usually paired, figs. 8, 9, 1a and 1b

2. Scales on top of head small, similar to, and merging into the neck and body scales, fig. 10. Viperidae (part)

Scales on top of head shield-like, quite distinct from the scales on the back of the body.

3. Head shields small and situated on front part of head only; belly scales do not extend across the full width of the underside. Boidae (Python)

Head shields large, covering top of head, fig: 8; belly scales extend more or less across full width of body beneath, fig 1a, b and c.

4. Enlarged fangs present in *front* of upper jaw, either fixed and peglike, fig 17, or curved and lying back, fig 11.

No obvious fangs in *front* of upper jaw.

5. Fangs fixed, peg-like. Elapidae

Fangs curved and lying back (seek out with pin). Viperidae

6. Long fang in upper jaw situated *behind* the eye (seek out with pin), fig 18 (In small snakes this back fang may be difficult to see, but the enlarged gum enclosing the fang is usually obvious.) Colubridae (back fanged)

No obvious enlarged fangs either in front of or behind the eye, ordinary teeth present or not evident. Colubridae (harmless)

Typhlopidae and Leptotyphlopidae. Blind-snakes & Worm-snakes.

The snakes in this section are easy to recognise, and cannot be confused with any other snakes. However, separating the two families and sorting out the species is work for an expert. The layman therefore may not wish to proceed further with this section.

1. Scale rows (all round mid body) more than 18; tail scarcely longer than it is broad at the base. Typhlopidae (Blind Snakes)

Scale rows (all round mid body) less than 14; tail three times as long as it is broad at base. Leptotyphlopidae (Worm Snakes)

Boidae. Python.

There should be no difficulty in recognising the python, which is the only snake in this section.

Tail short but ending in thin extremity; large snake, when full grown up to 7 m. (possibly more), photo iv. Python, *Python*,

Colubridae. (most of the common snakes).

There is sure to be some difficulty in identifying all the different snakes belonging to this family, unless the presence or absence of fangs behind the eye has been decided with certainty. However, consider the supporting characters in each couplet carefully and be prepared to assume you have overlooked the fang if the other characters match up to the specimen being a back-fanged species. Couplets 1-12 of the following key distinguish the harmless Colubridae, and 13-20 the back-fanged species.

1. Subcaudals paired, fig. 1a and 1b. 2

Subcaudals single, fig. 1c, (very small snakes). Centipede-eater, *Aparallactus*

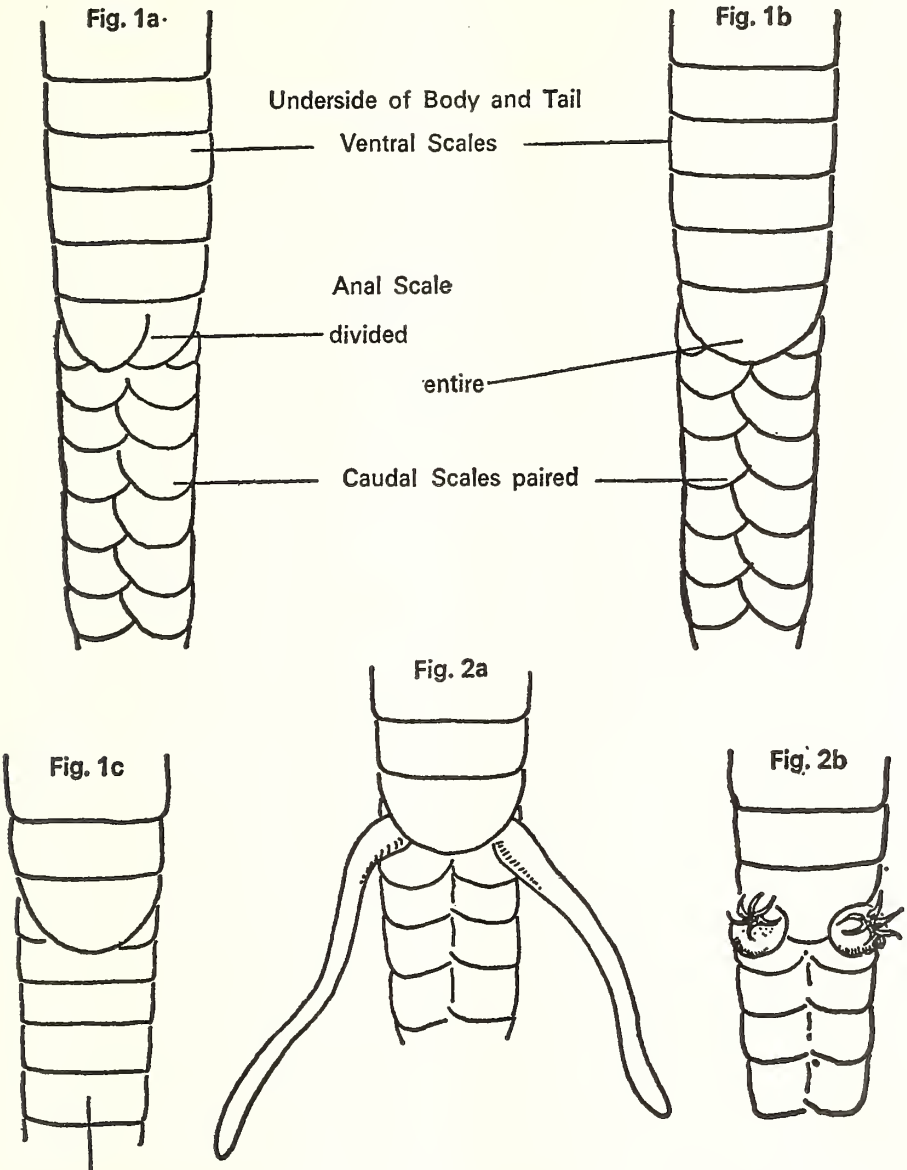
2. Long fang (grooved tooth transmitting venom) in upper jaw situated *behind* the eye. Seek out with a pin. The needle-fine fang is often hidden in a soft swelling of the gum, and may be very difficult to find. . 13.

No poison fang in upper jaw. A row of backwardly directed, needle-like, ordinary teeth may or may not be obvious. 3

3. Small to medium size Green snakes (dark bluish-grey when preserved in formalin). Green bush-snakes, *Philothamnus*

(Note:—Green phase of *Dispholidus* would key out here if the back-fang has been overlooked).

Snakes which are other colours and patterns. 4



Subcaudal scales single

Prosymna ambigua

Crotaphopeltis hotamboeia

Male Organ or Hemipenis extruded

4. Body scales *noticably* keeled. 5
Body scales *NOT* keeled. 6
5. Scale rows 21-27; scales heavily keeled and close together; skin not showing between scales. Only has minute teeth, so that jaws appear to be toothless. Body cylindrical fig. 5.
Egg-eating Snake, *Dasypeltis*
Scale rows 19 (scales keeled and overlapping) Black Tree Snake, *Thrasops*
(Note:—black phase of *Dispholidus* would key out here if conspicuous back fang is overlooked.)
Scale rows 15; scales heavily keeled but loosely held together; skin showing between scales. Teeth normal size. Body triangular in section. File Snake, *Mehelya*
6. Scale rows 17 or less. 7
Scale rows 18 or more. 9
7. Scale rows 17; head flattened, eye small, tail short; small blackish snake.
Wolf Snake, *Lycophidion*
Scale rows 15. 8
8. Pupil vertically elliptic rostral shovel shaped with sharp edge, inter-nasal single, fig. 15. Small snake, up to 30 cm. Shovel-snouted Snake, *Prosymna*
Pupil round, rostral rounded, inter-nasals two, fig. 14. Small snake up to 30 cm, with body laterally compressed and head narrower than body. Slug-eating Snake, *Duberria*
9. Mid-body scale-rows 23-33. 10
Mid-body scale-rows 19-21. 12
10. Anal entire fig. 1b; pupil vertical. House Snake, *Boaedon*
Anal divided, fig. 1a; pupil round. 11
11. Ocular scales present encircle the eye so the labials are not in contact with the eye, rostral shield beak-like. Grey Beaked-snake, *Scaphiophis*
No sub-oculars, so fourth labial scale touches the eye. Mole Snake, *Pseudaspis*
12. Mid-body scale rows 21, anal divided, fig. 1a. Semiornate Snake, *Meizodon*
Mid-body scale rows 19, (or 17 in sub-species *ulugurensis*), anal divided, fig. 1a.
Olive Marsh-Snake, *Natriciteres*
Mid-body scale rows 19, anal entire, fig. 1b. Black Tree Snake, *Thrasops*
(Note: *Crotaphopeltis* would key out here if the small back-fang is overlooked).
13. Scales keeled, narrow, and obliquely inclined, in 19 rows. (Tree snakes). 14
Scales smooth. 15
14. Pupil round, eye large, head short, fig. 20. Boomslang, *Dispholidus*
Pupil horizontal, eye with dark band through it, head elongated, fig. 19.
Twig Snake, *Thelotornis*
15. Dentition distinctive in that there are one or more long teeth between shorter teeth in the upper jaw. Therefore a long tooth in *front* of the eye resembles the true fang which is actually situated *behind* the eye, fig. 18. Sand-snakes, *Psammophis*
Dentition not as above; teeth, invisible, form an even series from the front of the upper jaw backwards to the fang *behind* the eye. (Specimens which are too small for the teeth to be seen properly will present a difficulty but should be included here). 16
16. Snakes which are sombrely coloured throughout, except that under-parts may be lighter and head darker than general colour. 17
Snakes having a marked pattern; body striped, marbled, barred, spotted or banded with different colours. 20
17. Scale rows 17. 18
Scale rows 19 or 21. 19
18. Rostral shield (snout) beak-like (stone coloured snakes, the body scales margined with amber brown; white, tinged with yellow below), fig. 6. Beaked-snakes, *Rhampiophis*
No beak. (Stone coloured and banded above, pure white below and with a row of pink spots along the side of the body). White-bellied Grass-snake, *Psammophylax*
19. Head broad, distinct from neck; eye fairly large with vertical pupil, figs. 8 and 9; scale rows 19 (The back-fang of this species is difficult to find.) White-lipped Snake, *Crotaphopeltis*
Head small and not distinct from neck; eye minute with round pupil. Scale rows 19 or 21.
Purple-glossed Snake, *Camelaps*
20. Small snake (up to about 40 cm) with a very characteristic dark brown mark on the head, which becomes zig-zag on the neck and breaks up into long-shaped spots along the top of the forward half of the body, photos. xii. Body marbled and dappled above and below, tail tending to be yellowish; tongue orange, pupil round; scale rows 17; the fangs are too small to be seen easily.
Bark-snake, *Hemirhagerris*
A medium sized snake (up to 90 cm). Colour pinkish-red, with evenly spaced black blotches down the back, starting with a dark band right across the neck, photo. vii. Head distinctly wider than the neck; whitish below; scale rows 19. Tiger-snake, *Telescopus*

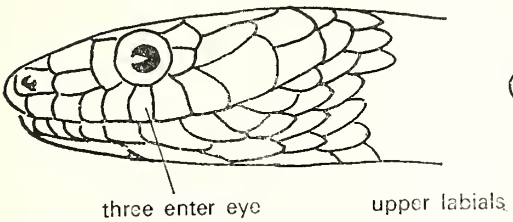


Fig. 3 Philothamnus irregularis

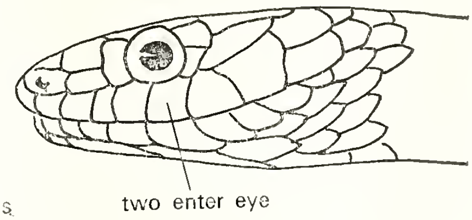


Fig. 4 P. hoplogaster

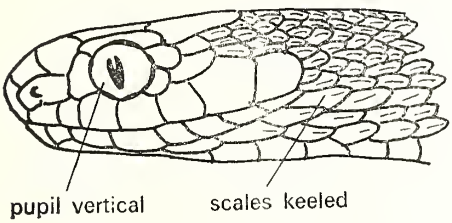


Fig. 5 Dasypeltis scabra

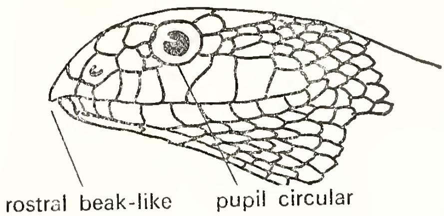
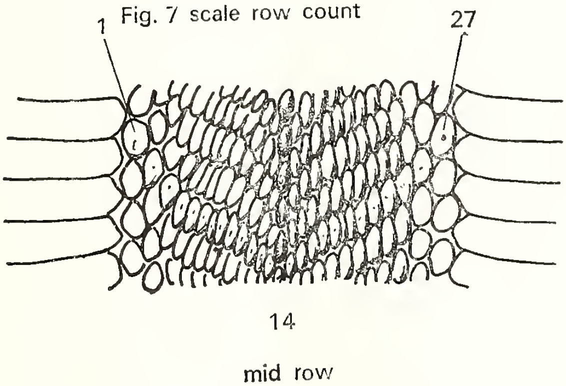


Fig. 6 Rhamphiophis acutus

Fig. 7 scale row count



Elapidae. Front-fanged snakes. Cobras and Mambas

The snakes in this section are all venomous and dangerous. Their fangs are situated in front of the mouth and are usually easy to see; many of the species are large and easy to identify. However, there always remains the possibility that a juvenile specimen may be obtained in which the characters are not easy to make out though the individual may already be quite dangerous. Juvenile mambas for instance might be mistaken for the harmless green snakes of the genus *Philothamnus*.

1. Tail short, sub-caudals less than 30 scale rows 13. Garter Snake, *Elapsoidea*
   Tail longer, sub-caudals more than 40; scale rows 19 or more. 2
2. Head rather long, straight sided, but narrowing towards snout; subcaudals more than 90. Long snakes, growing to nearly 3 m, and very slender. 3
   Head short, sides curved; snout broader than long; subcaudals less than 90. 4
3. Inside mouth bluish-black; mid-body scale rows 21-25 (usually 25); ventrals more than 240. Colour slate, olive, brown or green. Common Mamba, *Dendroaspis polylepis*
   Inside mouth bluish-white; mid-body scale rows 17-21 (usually 19); ventrals less than 240. Colour green. Green Mamba, *D. angusticeps*
4. Subocular scales present, fig. 16, therefore upper labials *not* contacting eye. Egyptian Cobra, *Naja haje*
   Subocular scales absent, fig. 17, therefore upper labials contacting eye. Underside of neck jet-black or irregularly marked pinkish, in either case distinctly coloured from underside of body. Spitting Cobra, *N. nigricollis*

Viperidae. Vipers or Adders.

The three groups of vipers are so different in general appearance from each other that the layman may find it difficult to believe that they all belong to the same family of snakes. However, they all have long, curved fangs, lying back in the front of the upper jaw, fig. 11. Once these are seen, and it is easy to find them and lift them up with a needle, it is easy to understand that all the vipers belong to one family. The true vipers of the genera *Bitis* and *Atheris* are fairly easy to recognise for those who are familiar with the appearance of the European adder. They all have the typical spade-shaped head which is covered with small scales instead of shields, as is more usual with most other snakes. The Night-adders on the other hand have shields on the head like other snakes, which they also resemble more in general configuration. The Burrowing-vipers, which are modified for a subterranean life, depart most of all from the usual conception of viper, because their heads are not only covered with shields, but the head is also actually much narrower than the neck and body. All species of vipers are venomous and dangerous.

1. Head spade-shaped, wider than neck, and covered with small scales, fig. 10 2
   Head not wider than neck, and covered with shield-like plates, fig. 12 3
2. Colour usually greenish; small rather slender snakes (up to 70 cm), found in trees. Tree Viper, *Atheris*
   Colour brownish or yellowish, distinctly pattened with dark markings; massive snakes, even young ones are heavily built; found on the ground. Puff Adder, *Bitis*
3. Shiny blackish burrowing snakes, recognised by head being indistinct from neck and conspicously narrower than body. Burrowing Viper, *Atractaspis*
   Snakes of normal appearance, usually patterned, but in any case a distinct pattern becomes visible when skin in stretched. Night Adder, *Causus*

Family Typhlopidae Blind Snakes.

The genus *Typhlops* is sufficiently different from all other Snakes to make recognition easy. The head and tail ends look alike. The eye-spots, fig 13, are hidden under a scale; the tail is short and stumpy. The body is cylindrical and the same width throughout, except in very big specimens which are fatter towards the tail end. The scales are close set and shiny and of the same type all round, see photo. I.

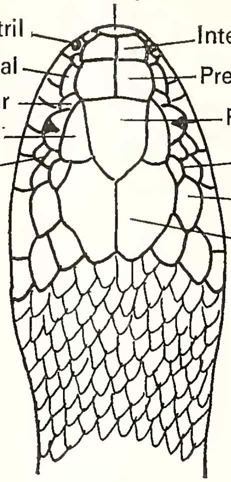
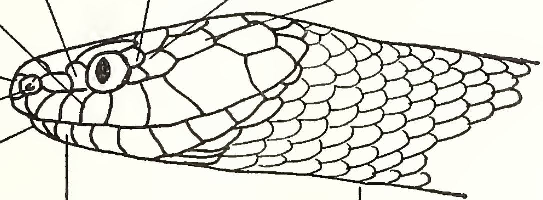


Fig. 8 Upper side of head, showing scales.



Side view of head, showing scales.

Fig. 9 White-lipped Snake *Crotaphopeltis hotamboeia*

The colour pattern is very variable and shows through the semi-transparent scales. Commonly these snakes are dark greyish variegated with ivory-white on the back and sides, and yellowish-white beneath. Another pattern comprises parallel rows of silvery-grey spots margined with black, and off-white underparts, photo. II.

All species are subterranean and they are adapted to this way of life. The rostral shield, see fig. 13, is hard and sharp, resembling a toe-nail, and is used for burrowing.

Typhlops feed on insects, termites providing their main diet. They are often found under rotten logs or in compost heaps; occasionally during the rains they come above ground. They become very fat and aestivate during the dry season.

All species lay eggs. Big fat females (700 mm.) of *T. schlegellii* have been found at the beginning of the dry season, with 40-80 eggs ready for laying. The eggs measured 15×10 mm.

Two species commonly occur in our area, and they can be recognised as follows:

Scale rows (all round body) over 30. Variable Blind-Snake, *T. schlegelii mucrosa* Peters.
Scale rows (all round body) under 25. Spotted Blind-Snake, *P. punctatus* (Leach).

The variable Blind — Snake is common and widespread. A common length is 250 (248+3) mm, but large ones measure 700 (695+5) mm and these are very massive.

The Spotted Blind-Snake occurs in forested areas, or areas that were formerly forested. On the average this species is smaller, 200 (196+4) - 330 (322+8) mm; the scales are larger but in fewer rows and the snout is less sharp. Both species, however, have the same variable colour pattern.

There are several other species of *Typhlops* in East Africa which need study. Also certain legless burrowing lizards (*Amphisbaena* and *Geocalamus*) and amphibians (Caecilidiidae) might be mistaken for *Typhlops*. All these burrowing creatures should be collected and sent to the Museum for identification.

Leptotyphlopidae. Worm Snakes.

Leptotyphlops resemble tiny, slender *Typhlops*, it is likely many people would not recognise them as snakes at all.

The commonest species is *L. conjuncta* (Jan), Jan's Worm Snake. A large specimen collected in Arusha National Park (1500 m alt.) measured 253 (241+12) mm, the mid-body diameter of 3.5 mm going 72 times into the total length. Colour uniform dark-slate; other specimens occasionally dark brownish.

Habits, habitat and food in general similar to *Typhlops*.

Boidae. Pythons.

Python sebae (Gmelin) Python.

The python is widespread and quite common. It is the largest African snake and the photograph clearly illustrates its appearance so further description is unnecessary.

The African python may reach a live length of 6 m, but anything over 4 m is big. Young ones on hatching are between 60–70 cm.

Pythons kill by constriction. Juveniles feed on rats, large adults on any warm blooded animal up to the size of small antelopes. They are rather sedentary creatures and tend to frequent moist places where their prey is easy to obtain. They climb trees easily and spend days coiled up in the branches. This habit often saves them from bush fires. Arusha and Tarangire National Parks are particularly good places to see pythons.

The female lays a cluster of eggs, between 30–50 at a time. She selects a suitable place for laying and coils round her clutch till the eggs hatch. After that, maternal instincts end.

Pythons are not dangerous, not venomous and should be protected. Many African cults venerate these fine snakes; trade in python skins should be severely discouraged.

Puff Adder Bitis arietans

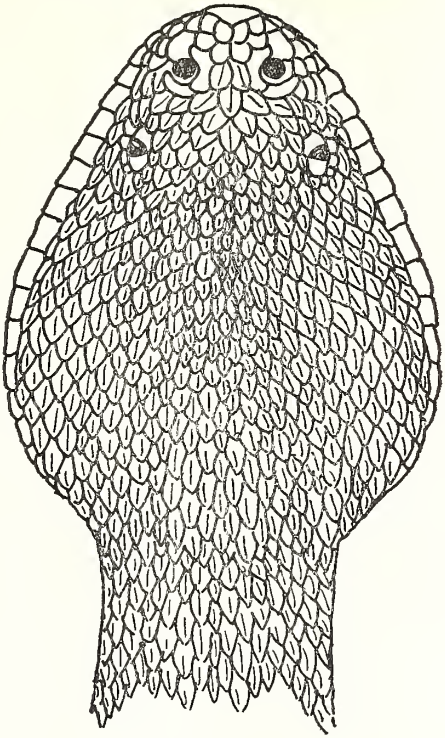


Fig. 10

Upper side of head showing wide head distinct from neck, and keeled scales similar to those of neck and body.

Fig. 11

Side view of head, showing long curved fangs erected in front of mouth.

Colubridae.

Sub-family Colubrinae Harmless Snakes.

Boaedon fuliginosus (Boie) House Snake.

The commonest East African snake. It is not big, the largest collected being 1080 (942+138) mm, just over 3½ feet. It is undistinguished in appearance, being blackish-grey back and sides, and mother-of-pearl white below. In some districts this species is brown, and occasionally individuals of other colours or patterns occur. The best diagnostic characters are the high (27–35) number of mid body scale rows, and a distinctive light line extending from behind the eye. Other recognition details include a verticle pupil and entire anal; the tail is rather short about one seventh of the length of body in females and one sixth in males. Juveniles are not differently coloured from the adults; hatchlings about 200 mm long.

Nocturnal and retiring; oviparous, some 10 eggs being laid usually during the rains. Food: rodents and frogs which are killed by constriction.

Common in Arusha National Park.

Duberria lutrix (Gunth.) Slug-eating Snake.

This is definitely an upland species occurring from 1500 to 2700 m alt. It is a small snake (one collected at Mbeya measuring 410 (360+50) mm was exceptionally large) and most individuals are under 300 mm.

The species is widespread but its distribution is discontinuous and some different subspecies have been described. For general recognition, the slug-eater, is best described as a plain blackish or brownish unpatterned little snake with whiteish underparts. The head is small but the eye prominent, fig 14; the body is rather compressed with only 15 scale rows, and the tail ends in a sharp point.

Slug-eating Snakes can be found under stones or logs and in tussock grasses, they are rarely seen out in the open. Young are born alive. The food consists of slugs and sometimes snails.

Common in Arusha National Park.

Lycophidion capense (Smith) Wolf Snake.

Common and widespread. This is a small species measuring 480 (430+50) mm; dark grey or brownish in colour with a whitish chin and silvery-edged ventral scales. Other diagnostic characters include the rather short tail, one tenth of body length in females and slightly longer in males; flat head with no distinct neck, small eye, elliptic pupil and entire anal scale. Individuals may have silvery dots at the tip of each body scale which sometimes form an obscure mid-dorsal zig-zag pattern, photo vi.

Nocturnal, retiring and oviparous. Food: lizards, usually skinks, often quite big ones which the snake overcomes by constriction, sometimes after quite a struggle.

Common in Arusha National Park.

Mehelya capensis (Smith) File Snake.

Although widespread this large, 1400 (1245+155) mm, and very distinctive snake is seldom seen. The basic colour pattern may be greyish, brownish or blackish, with a mid dorsal ivory-white ridge; under parts whiteish. The body is triangular in cross section and the scales are keeled, hence the name file-snake. The anal scale is entire.

Nocturnal, secretive, very docile and lays a few rather large eggs. Food: other snakes, often poisonous ones, less frequently amphibians and small mammals.

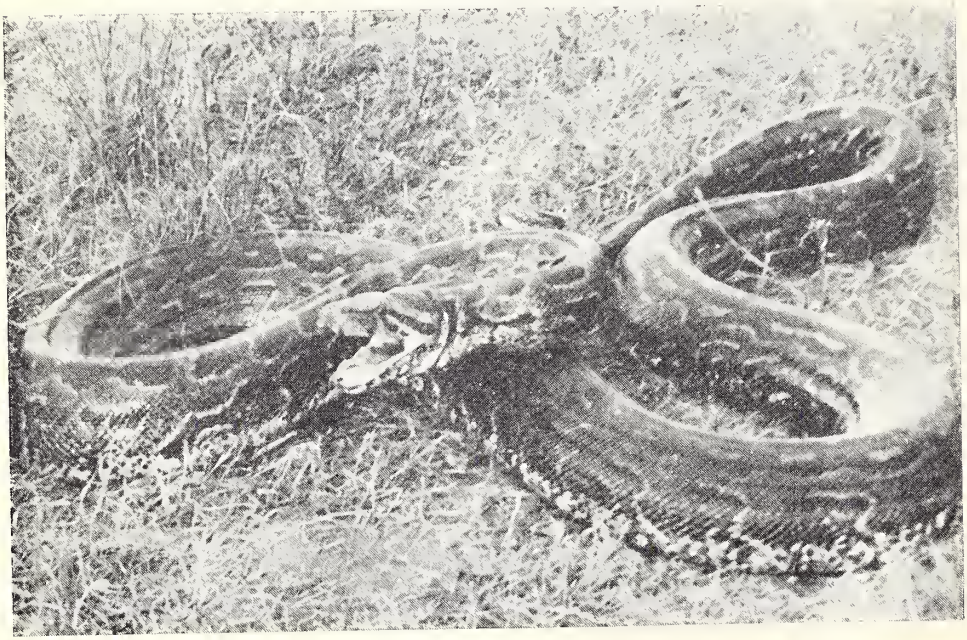
Trasops jacksoni Gunther. Black Tree-snake.

This is a western forest-frequenting species, but a population occurs in the central Kenya highlands which has been recognised as a distinct sub-species named *T. j. schmidti* Loveridge.

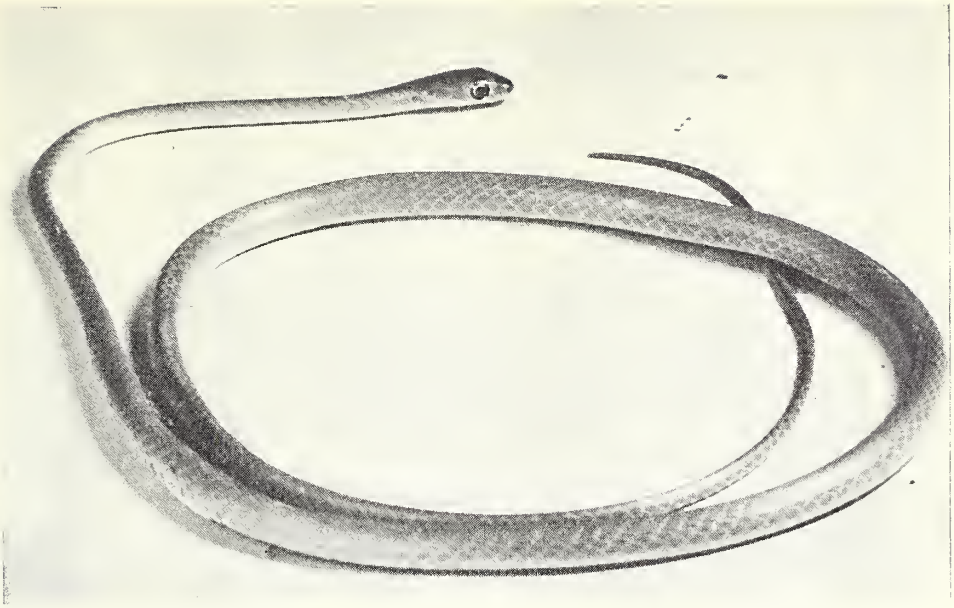
i Variable Blind Snake, *Typhlops schlegelii*

ii Spotted Blind Snake, *Typhlops punctatus*

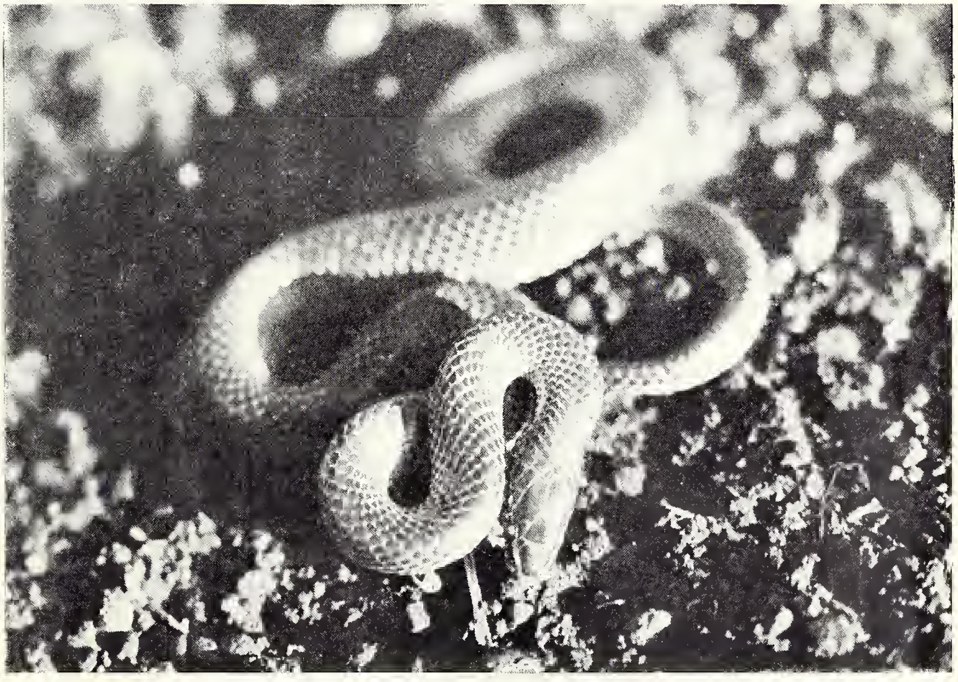
iii Grey Beaked-snake *Scaphiophis albopunctatus*



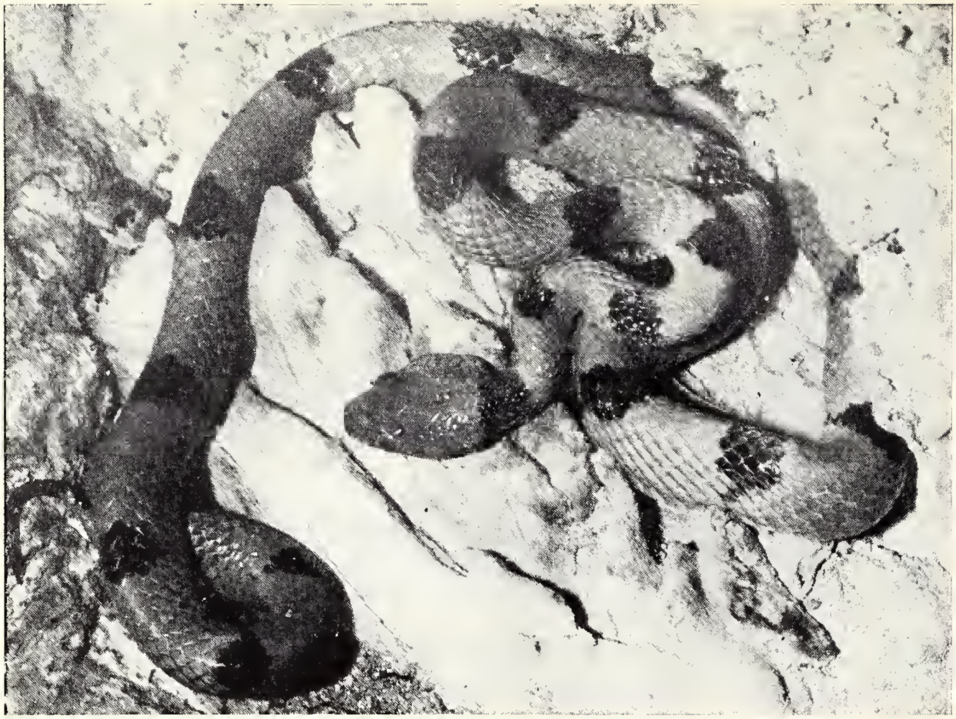
iv Python, *Python sebae*



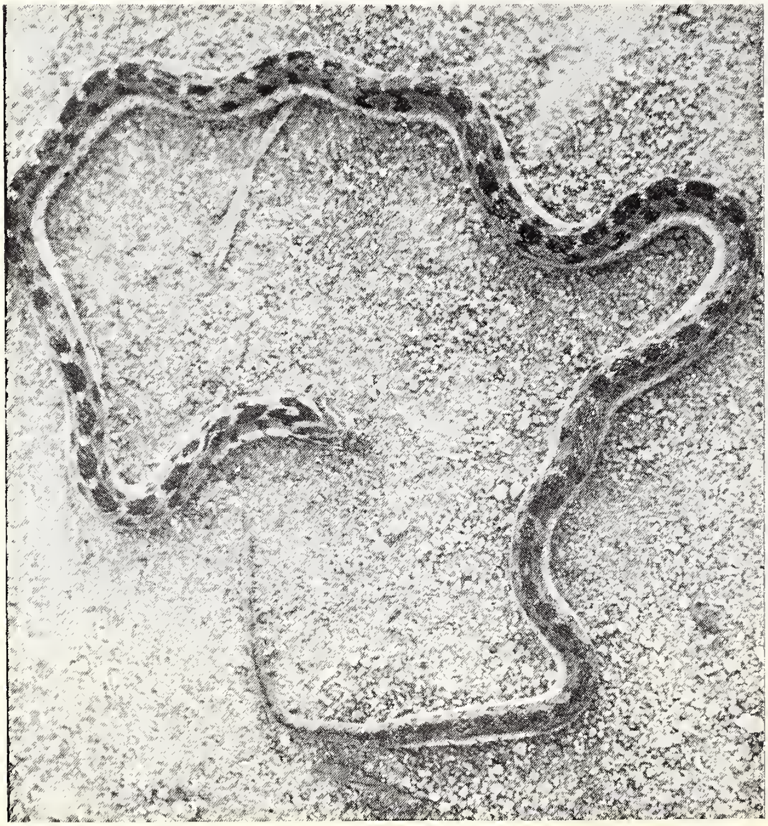
v Green Bush-snake, *Philothamnus hoplogaster*



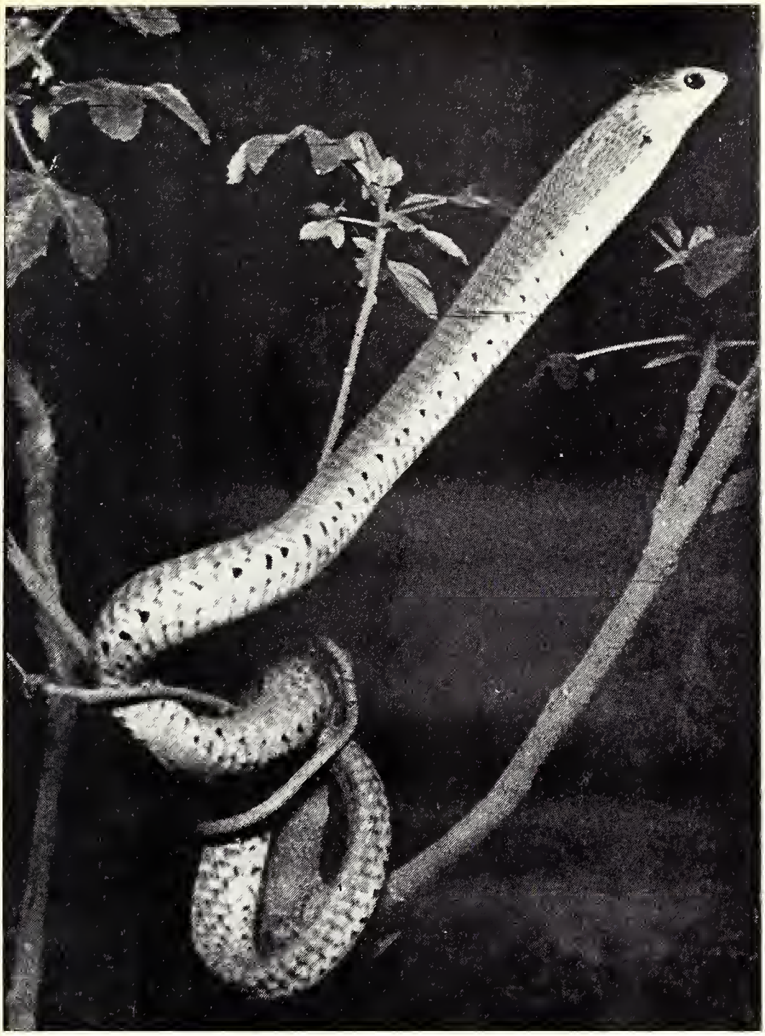
vi Wolf Snake, *Lycophidion capense*



vii Tiger-snake, *Telescopus semianulatus*

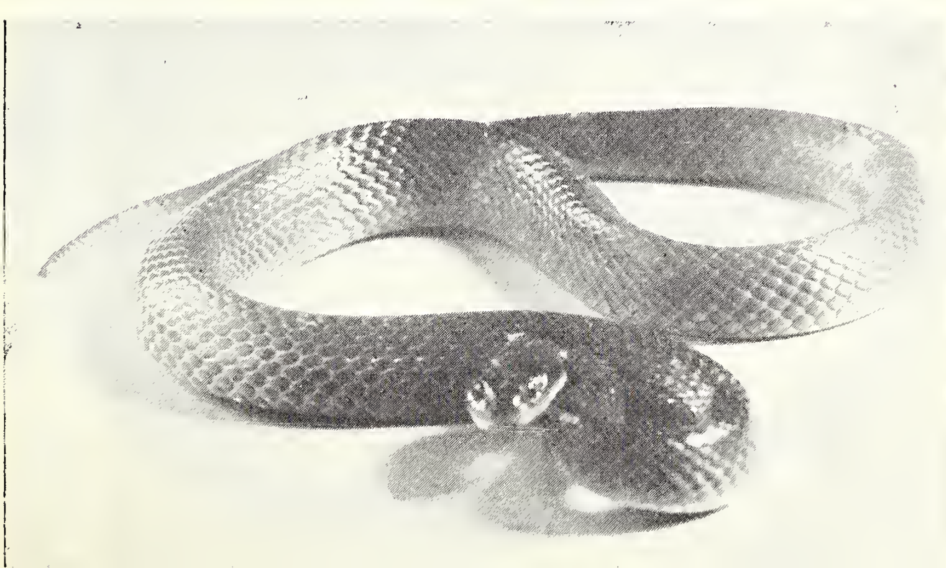


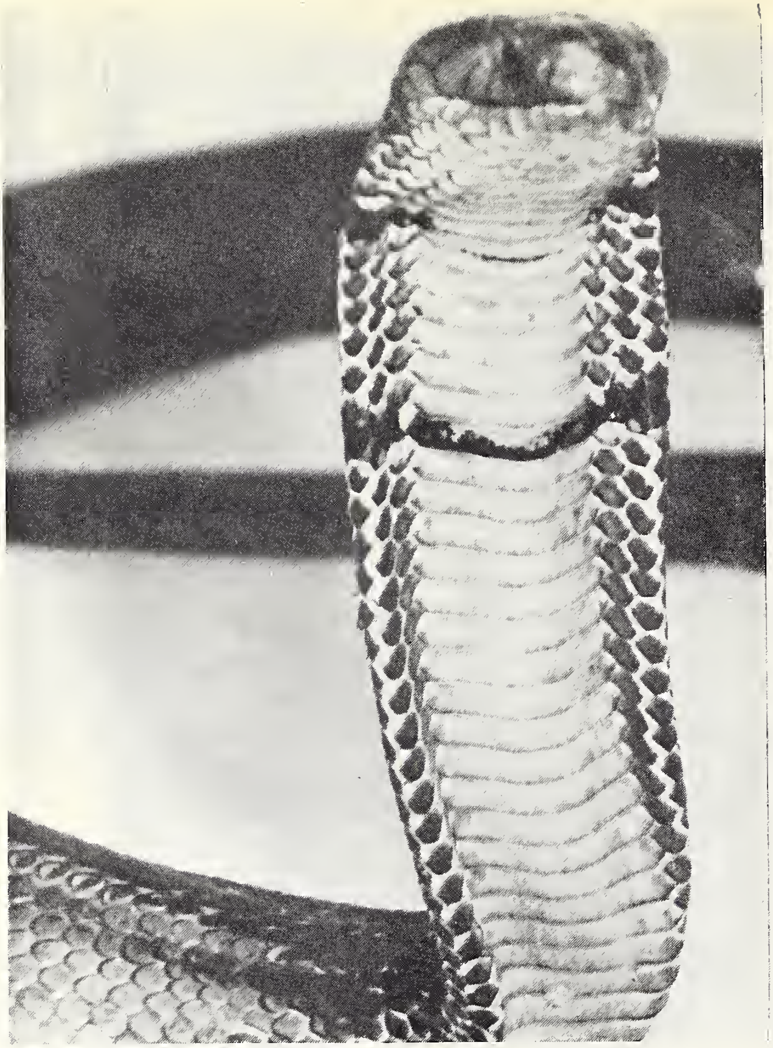
viii Egg-eating Snake, *Dasypeltis scabra*



ix Boomslang, *Dispholidus typus*

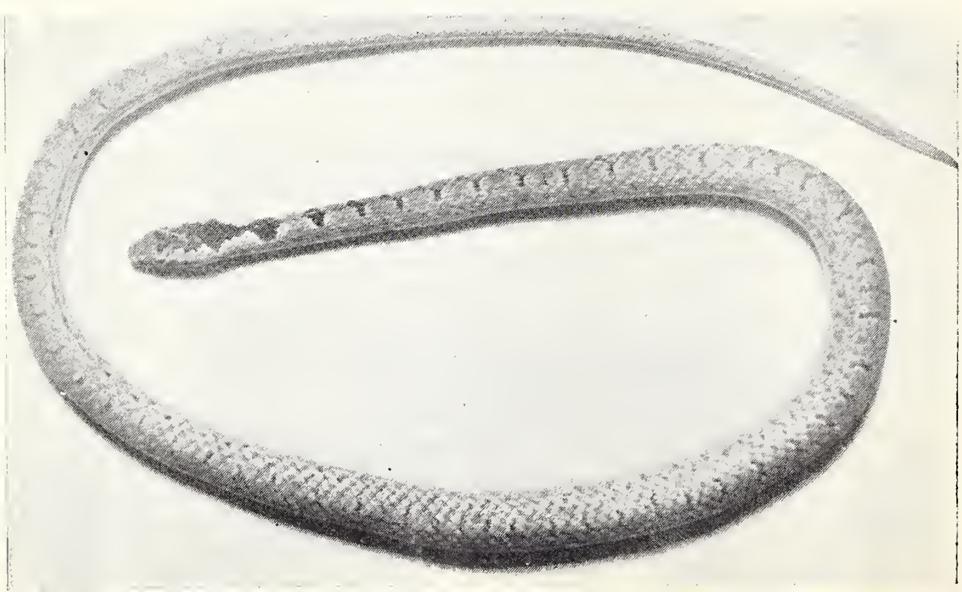
x White-lipped Snake, *Crotaphopeltis hotamboeia*

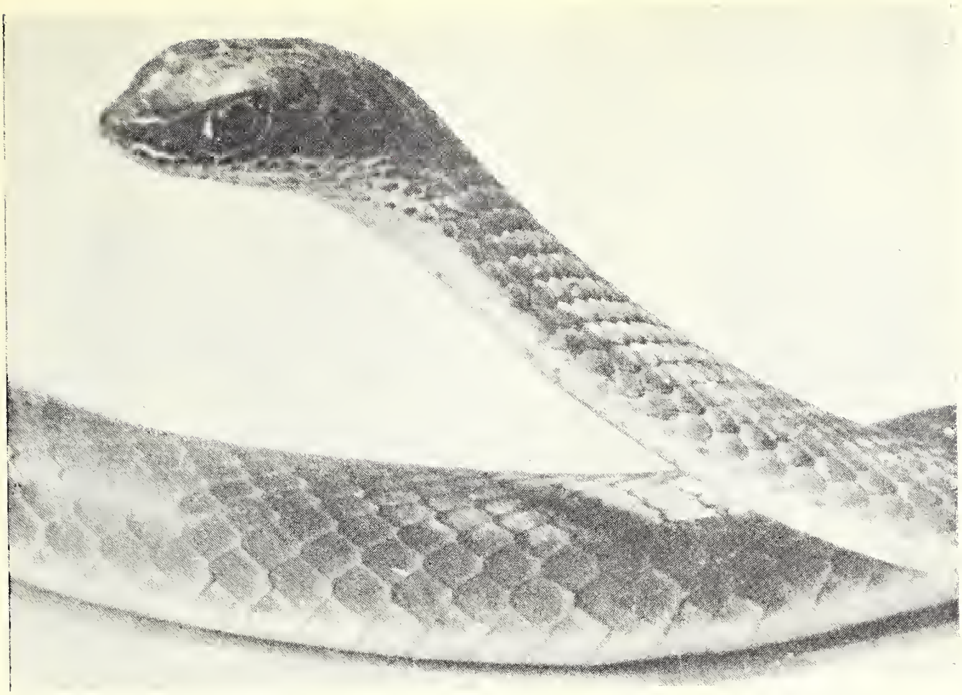




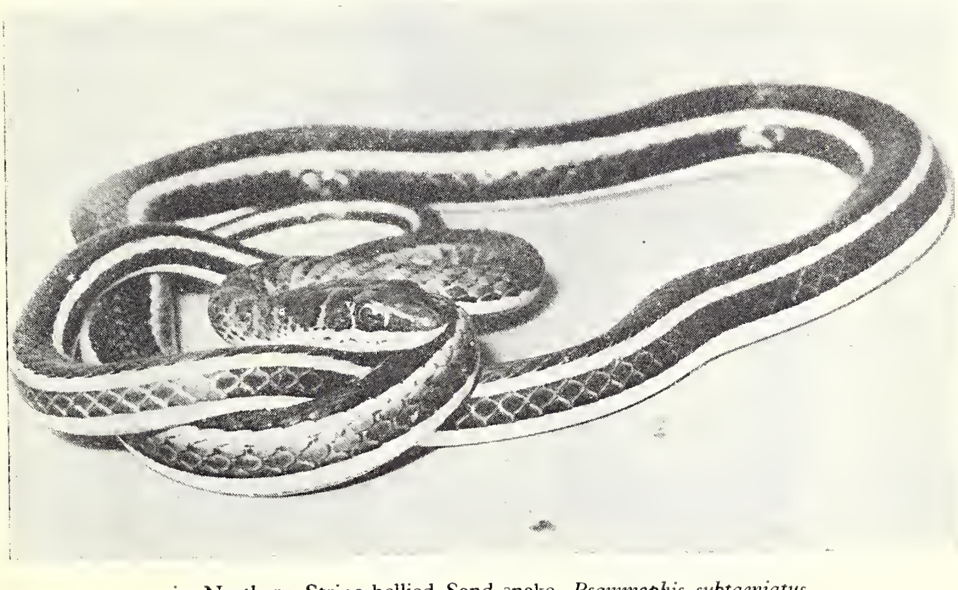
xi Cobra, *Boulengerina annulata*

xii Bark-snake, *Hemirhagerrhis nototaenia*

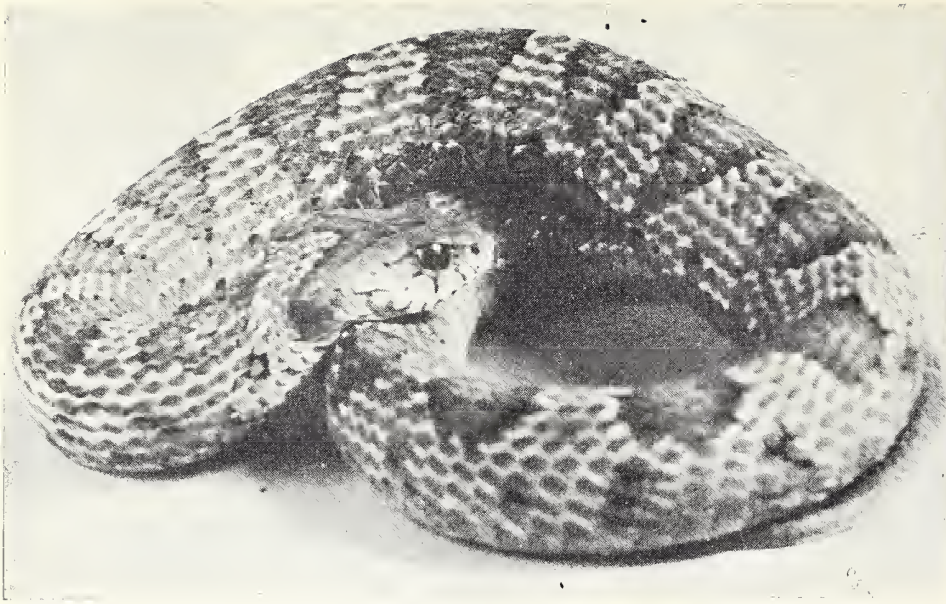




xiii Hissing Sand-snake, *Psammophis sibilans*



xiv Northern Stripe-bellied Sand-snake, *Psammophis subtaeniatus*



xv Rhombic Night-adder, *Causas rhombeatus*

xvi Burrowing-viper, *Atractaspis bibroni*

Black Tree-snakes are large, specimens up to 2 metres, over 6 ft, being on record. The most extraordinary thing about the harmless Black Tree-snakes is that in life they can hardly be distinguished from the black phase of the poisonous Boomslang.

The writer has only seen *Thrasops* in the Nairobi Snake Park, so nothing about the habits of this beautiful snake can be added here.

Meizodon semiornata Peters   Semiornate Smooth-snake.

A medium sized snake, adults 680 (530+150) mm; juveniles measure 230 (180+50) mm. Not often seen in the area treated probably because it is commoner in wet places at lower elevations.

Diagnostic characters include a rather long tail, which may be up to 25 per cent of total length. The eye has a circular pupil, the neck is distinct and the anal scale is divided. There are 21 scale rows which should be carefully counted. The general colour of adults is blackish. Being a rather sombre snake, it is therefore rather difficult to distinguish it from others of similar hue. Points to note are that the chin is white, and there are usually some dark vertical bars along the side of the neck and fore part of the body. The lips are whiteish and the upper labials margined with white. The ventral scales are narrowly bordered with silver along the posterior edge. Juveniles tend to be more distinctly patterned than adults.

Smooth-snakes inhabit grassy valleys near water. They are about at night and during overcast rainy days. Their main food comprises frogs.

Natriciteres olivacea Peters   Olive Marsh-snake.

A widespread and fairly common species inhabiting damp places. A rather small snake, 472 (347+125) mm. Recently hatched juveniles may occasionally be found clustered in a cavity, length of smallest found was 159 (87+72) mm.

Although variable and not striking in appearance the colour pattern is often quite distinctive. The body is dark grey or brownish grey with an oily sheen, often with a dark mid-dorsal band; ventral scales yellowish in the middle with greyish margins. Lips and chin yellowish or white, labial scales margined with black. Other spot characters include, round pupil, divided anal and rather long tail, which, however, is often damaged.

Marsh-snakes may be seen during the daytime in damp places. Food frogs and small fish.

Common in Arusha National Park.

Philothamnus (Synonym *Chlorophis*)   Green Bush-snakes.

This genus includes small to medium length, harmless, green, round eyed diurnal arboreal snakes with 15 mid-body scale rows. There are several species, Loveridge (1951) three of which are likely to occur in the area treated. These can be distinguished as follows.

1a.	Ventral and subcaudal scales sharply angular at the sides; fore part of the body and neck with blackish spotting and barring; usually more than 130 pairs of subcaudals.	*P. semivariegatus.*
1b.	Ventral and subcaudal scales normally rounded at the sides; plain green; usually less than 130 pairs of subcaudals.	2
2a.	Two upper labials contact eye, fig., 4.	*P. hoplogaster.*
2b.	Three upper labials contact eye, fig. 3.	*P. irregularis.*

P. semivariegatus (Smith) Spotted Bush-snake.

A common and widespread species. The body is slender and the tail long, a big one measured 980 (680+300) mm. The scales are green but some of them on the front part of the body are edged with black and torquoise. This causes a barred and spotted effect. The underparts are yellowish-green. The eye is large and clear, and the neck slender and distinct, the ventrals and subcaudals are flattish and sharp edged which facilitates rapid movement among twigs of bushes.

Although active by day, these green snakes are hard to spot among the foliage. Food mainly lizards.

P. hoplogaster (Gunther) (Syn: *Chlorophis neglectus* (Peters)) Southeastern Green-Snake.

A common species with a southern distribution. Occurs in Arusha National Park. Smaller than the last, a good size being 590 (431+159) mm. The whole body is unadorned pea-green colour, becoming yellowish-green below. The scales overlap, and the hidden edge is turquoise blue. Also the actual skin under the scales is black. But these colour variations only show if the skin is considerably distended, photo. v.

This species frequents bushes particularly in the vicinity of water. Feeds mainly on frogs.

P. irregularis (Leach) Western Green-snake.

A common species with a western distribution. Very similar to the last but slightly longer, 820 (520+300) mm.

The habitat and habits are also similar.

Prosymna ambigua (Pfeffer) Shovel-snouted Snake.

A small blueish or brownish grey, flat headed snake with a rather short tail. Widespread but easily overlooked or confused with other small black species. Normal adults average 300 mm and juveniles 118 mm. A male measuring 453 (393+60) mm was exceptionally large for the species.

The snout is sharply produced like a shovel. The prefrontal and antinasal scales (those on top of the head between eyes and snout) are undivided, see fig. 15 (in other snakes these scales are paired). Mid body scale rows vary from 15–17; anal entire.

Prosymna is a burrowing snake, occuring in soil and under logs, stones, etc. It comes above ground at night. Probably feeds on small invertebrates.

Common in Arusha National Park.

Pseudaspis cana (L.) Mole-snake.

This species is widespread but seldom seen although it is large, 1200 (1055+145) mm, harmless and useful.

Distinctive characters of adults are the obese, rather flabby, very smooth and shiny body, with usually 27 scale rows (sometimes 25 or 29), narrow head, small eye, prominent snout and short tail. Note that the anal scale is divided and that the fourth upper labial contacts eye. The colour pattern is often pale grey with a brownish tinge and black tips to the scales. But this species is very variable and in some localities mole-snakes are blacker and elsewhere browner.

Juveniles, 330 (288+42) mm, have a very distinct colour pattern. The ground colour is stone, brownish, even reddish. From the middle of the back, alternating blackish bars extend down the flanks. These bars are interrupted by two white spots and end in white spotted lower flanks. The ventrals are rather narrow, not extending right across the underside. The whole of the underparts from chin to vent are off-white variegated with irregular black blotches and bars. Underside of tail white. Top of head unmarked, upper labials white divided by dark bars.

Mole-snakes are common in highland areas, but live underground and are very secretive. Food rodents.

Scaphiophis albopunctatus Peters Grey Beaked-snake.

The Grey Beaked-snake seems to have a more western and lowland distribution than the area treated. But being very distinctive the species is included in the hope that it will be recognised in a new area.

This is a medium sized snake, 860 (730+130) mm. The rostral shield is projecting like a hawk's bill. The general colour is grey above and white below; juveniles are lighter

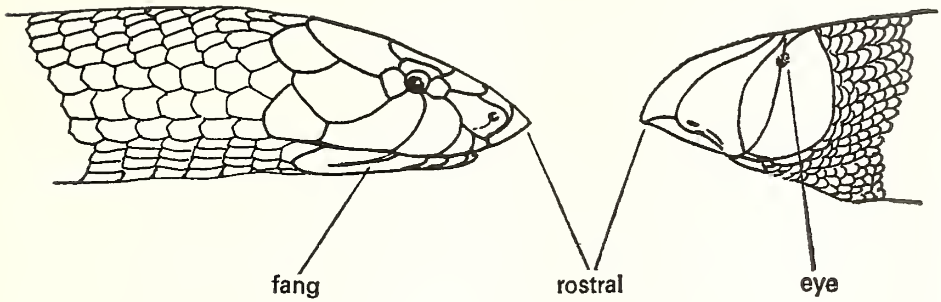


Fig. 12 Atractaspis bibroni

Fig. 13 Typhlops schlegelii

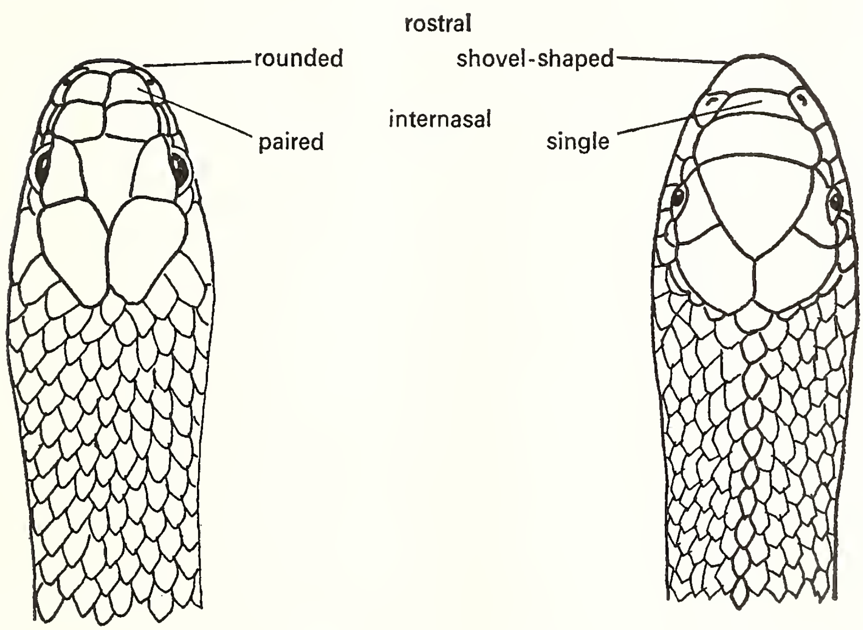


Fig. 14 Duberria lutrix

Fig. 15 Prosymna ambigua

coloured with a scattering of tiny milky coloured spots. The number of mid-body scale rows is rather variable, females may have a higher count than males. The tail is rather long, 25 per cent of total length; neck indistinct; pupil round and the eye completely encircled with ocular scales; the mouth closes with valve-like precision, the lower jaw fitting into a groove in the upper; the anal is paired, photo. iii.

Nothing seems to be known about the habits of this snake, except that it burrows. Its food is unknown, except that sand is often found in the stomach which suggests some soil inhabiting creatures like worms or termites.

Sub-family Dasypeltinae.

Dasypeltis scabra (L.) Egg-eating Snake.

This widespread and common species is in many ways the most interesting of all East African snakes. Their peculiarities are all concerned with the habit of eating fresh eggs, photo. viii.

It is not a large species. One collected measuring 980 (865+115) mm was exceptionally big. Typically the ground colour is greyish or greyish-brown with a very distinct pattern. There is a backwardly directed V-motif on the top of the head and a mid-dorsal series of dark rhomboid saddle-patches all the way down the back, and a series of dark blotches along each flank. The scales are keeled.

In this livery the egg-eater closely resembles the venomous Rhombic Night-adder, indeed the pattern is evidently a case of mimicry, and the display of false colours is intensified by aggressive behaviour. The snake, when alarmed, writhes from side to side, rasping its keeled scales on the ground, and striking furiously at its aggressor; the inside of the wide open mouth is deep blue.

But this display is all bluff, egg-eaters have no functional teeth at all. The fascinating performance of egg swallowing is easy to observe in a captive individual. First the egg is inspected for freshness and then pushed up against a support to get a purchase. The egg is then seized, and in a series of gulps the jaws slide over the shell and the elastic skin of the neck expands prodigiously to envelope the egg. The palate acts like a suction pad to prevent the egg slipping. After the egg has been engulfed, the shell is forced against a series of knobs which project downwardly from the vertebrae of the neck. The forward 'teeth' are sharp and split the shell; the rearward ones are knobly and serve to crush and roll the shell. The liquid contents of the egg then flows into the stomach. Finally the empty shell is regurgitated, neatly folded over like a pea pod.

It is certainly quite remarkable how big an egg this small headed snake can swallow. Even small birds eggs seem large for juvenile egg-eaters which measure about 250 (215+35) mm. One would imagine a newly hatched snake starts life with a problem. First to find an egg, next to find one small and fresh enough to swallow. In fact hatchling egg-eaters can easily swallow weaver bird size eggs measuring 22.5×15.5 mm.

Dasypeltis is active and nocturnal, both arboreal and terrestrial in its search for nests and eggs. The species is common in the Arusha National Park.

Sub-family Boiginae

Aparallactus Centipede-eaters.

There are six species in this genus in the E. African check-list. Only one, *A. capensis* Smith is treated here, because not only is it common and widespread woodland species in Tanzania, but it is also the species occurring in our area. But it must be mentioned that *A. jacksonii* (Gunther) is recorded from the Kenya and Tanzania borderlands around the base of Kilimanjaro. The writer has no knowledge of this latter species, so the following notes all apply to *A. capensis.*

The Centipede-eaters are tiny, slender snakes, 285 (240+45) mm being average. Specimens of up to 380 mm, or 15 inches, are on record but they must be unusual.

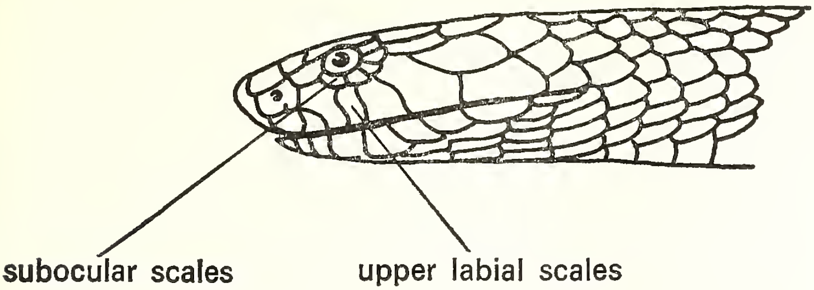


Fig. 16 Naja haje

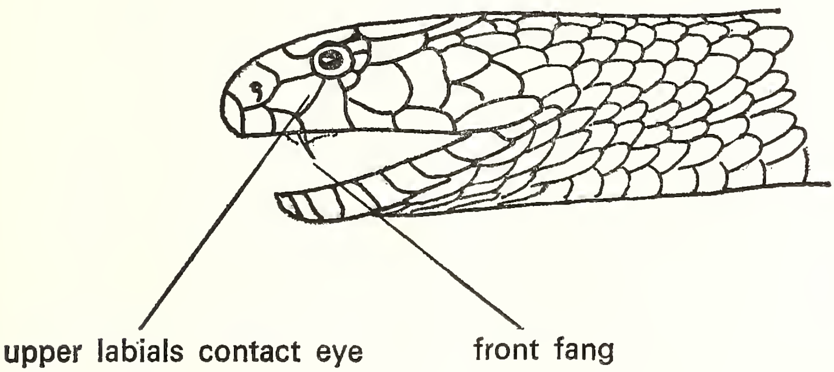


Fig. 17 Naja nigricollis

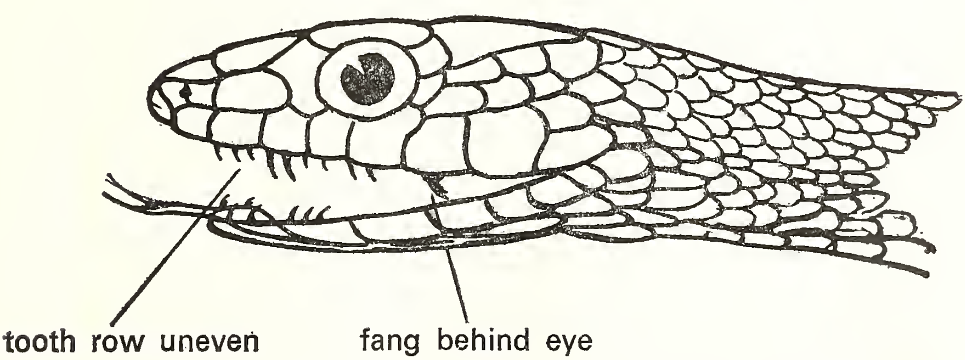


Fig. 18 Psammophis sibilans

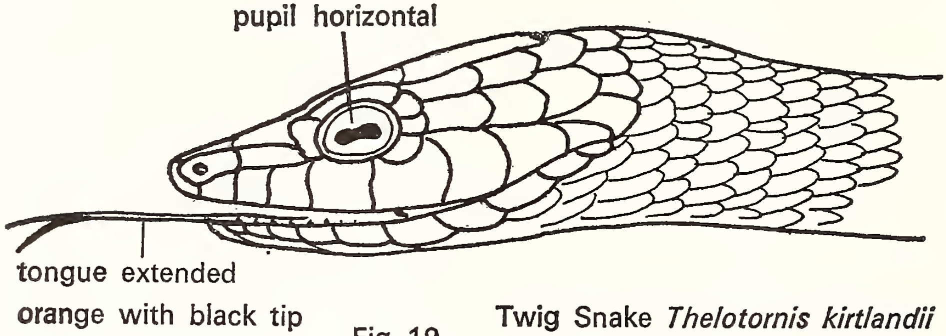
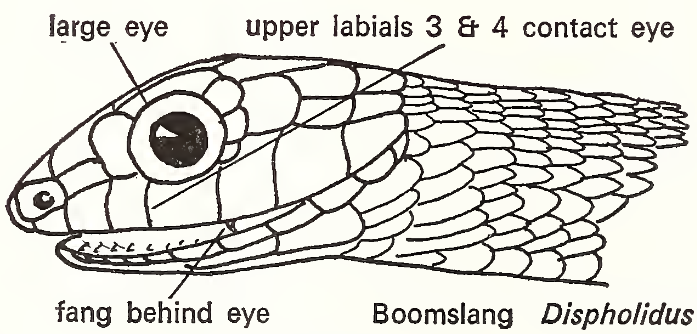


Fig. 19 Twig Snake *Thelotornis kirtlandii*



Boomslang *Dispholidus typus*

Fig. 20

Although so small, *Aparallactus* is back-fanged and poisonous, though it could not open its mouth wide enough to harm a person even as much as a bee. They are distinctly marked. The back is warm brown and the under side white tinged with yellow. The head and first few scale rows of the body, are very dark brown; the lips (except just under the eye where they are dark brown) and a few scale rows on the side of the neck, are white. The most distinctive character of all to note is that the subcaudal scales are single and not paired like most other snakes, see fig. 1c. Mid body scale rows 15.

Centipede-eaters are secretive little snakes that hide away in crevices, under logs and in tussocks and termitaria. Very little is known about their habits. They lay eggs. They probably eat termites as well as centipedes. They need somebody to study them.

A. capensis occurs in Arusha National Park.

Crotaphopeltis h. hotamboeia (Laurenti) White-lipped Snake.

This species shares the distinction with the House snake (*Boaedon*) in being the commonest snake in East Africa and they are rather alike. It is quite easy, however, to tell the two species apart by the mid body scale row count, 19 for the White-lipped, 29–33 for the House Snake. An exceptionally big White-lipped measured 735 (675+60) mm. Typically this species is an undistinguished blackish-grey, the top of the head is darker; the underparts, and the lips, are off-white. Other recognition characters are the wide head, vertical pupil, distinct neck and rather short tail, see figs. 8 and 9. Juveniles often have a minute milky spot on some scales which may form an obscure pattern on the back and sides, photo. x.

This snake is nocturnal, terrestrial and retiring. It is aggressive when first encountered and large ones, being back-fanged, should be treated with respect. About a dozen eggs are laid in compost heaps and such like places. Food usually frogs.

Common in Arusha National Park.

Dispholidus typus (Smith) Boomslang.

Common and widespread but, although a tree inhabiting snake, this is not a forest frequenting species. For this reason it is certainly not common in formerly forested areas such as the Nairobi and Arusha districts. It can, however, be expected to turn up in gardens and such like places. The true home of Boomslangs appears to be the vast deciduous woodlands that cover so much of East Africa. This is a rather big snake, a length of 1465 (1085+380) mm, or somewhere around 5 ft, is quite usual, photo. ix.

Boomslangs are beautifully and brightly coloured, but the pattern is so variable that they can be easily confused with other species. A common form is black, with each scale ornamented with yellow, greenish-yellow or blueish-yellow spots, the head shields in particular being variously margined with the same colours. The underparts are essentially the same colour as the spots, each scale more or less margined with black.

But self coloured individuals, usually males, are common. Pure green ones could be mistaken for the green bush-snakes (*Philothamnus*), or mambas (*Dendroaspis*); black ones for the Black Tree-snake (*Thrasops*). There is sometimes a tendency for the pattern to have a longitudinal striped arrangement in which case confusion arises with the Sand-snakes (*Psammophis*). Rather rarely the pattern is variegated, and the snake then closely resembles the Twig-snake (*Thelotornis*).

But if one is not confused by the colour pattern, the Boomslang is an easy snake to recognise. The eye is large with a round pupil, and is set rather far forward in a short head. The body is rather compressed from side to side and the scales are overlapping and set at an oblique angle, and each is distinctly keeled; there are 19 mid body rows. The anal is paired and the tail rather long, rather over $\frac{1}{4}$ of total length in males and just under in females, see fig. 20.

These beautiful snakes are diurnal, arboreal and inclined to display by inflating the neck when alarmed. Their venom is virulent but being back-fanged and not particularly

aggressive there is really no danger unless the snake is handled. Their favourite food is chameleons, but young birds, eggs and a variety of other creatures may be taken. Boomslangs are often mobbed by birds.

Hemirhagerrhis n. nototaenia (Gunther) Bark-snake.

This nice little snake attains a length of 335 (250+85) mm or slightly more. It is a woodland species and not found in formerly forested areas.

The colour pattern is distinctive and seemingly constant. The whole snake is marbled a pinkish-brown colour, both above and below. The top of the head is speckled with brown, becoming dark brown on the nape and this colour is continued as a blotchy zig-zag line down the back, eventually breaking up into a series of blotches and spots. The dark area of the neck is flanked with orange and the end of the tail is yellow. The tongue is orange at the base. In general appearance, therefore, the Bark-snake is rather like a tiny Twig-snake, but the circular pupil of the former removes any doubt even if confusion between the two species was possible, photo. xii

Bark-snakes spend their time secreted under bark, often with their head sticking out. From this position they seize small lizards upon which they prey.

Psammophis Sand-snakes.

The classification of the snakes in this genus has given trouble to experts, see Loveridge (1940) and Broadley (1966). Without going into details of racial distinctions, we have to consider 4 species as possibly occurring in our area. The following key, partly adapted from the literature, may be helpful in identifying them.

1. Mid-body scale rows 15 — *P. biseriatus.*
   Mid-body scale rows 17. — 2
2. Three black stripes along the body; underparts greyish heavily speckled with black. — *P. punctulatus.*
   Back and sides longitudinally zoned different shades of brown, brownish-grey or olive; underparts white, or tinged with yellow, and with a continuous black pencil line all the way down the outer one-eighth of each ventral and subcaudal scale. — *P. subtaeniatus*
   Body not banded; below whitish or tinged yellow, sometimes spotted but not distinctly so, no pencil line. — *P. sibilans*

Psammophis s. sibilans (L.) Hissing Sand-snake.

Common and widespread in the woodlands wherever there is convenient shelter, but not occurring in rain forest. This is a large species, 1815 (1345+470) mm, or 5½ ft, being a good sized specimen; it is also rather massively built, see photo. xiii.

The general colour is olive-brown, olive-green, brownish stone-colour or biege above, occasionally lighter on the flanks. The underparts are whitish or yellowish and usually lightly peppered with grey. The chin is white and usually spotted. The lips are light coloured and marked with irregular shaped, golden centred, dark edged spots. The mid dorsal scales along the body are usually distinctively coloured, being light at the base and dark at the tip. Juveniles tend to be longitudinally banded, but not adults.

This is an active diurnal snake frequently encountered ranging across country in search of prey which consists of frogs, lizards and rats. At other times it will remain motionless in the grass with head held aloft surveying the scene with watchful eyes.

All the sand-snakes are back fanged and so big ones should be treated with respect.

P. subtaeniatus sudanensis Werner Northern Stripe-bellied Sand-snake.

Common and widely distributed in the woodlands throughout Tanzania and Kenya up to about 1200 m altitude. This is a rather smaller snake than the last, a good size being 1312 (880+432) mm; it is also more lightly built, photo. xiv.

The colouration is brownish above, the individual scales being dark edged or divided into two shades of grey or olive, which causes a longitudinal banded effect. The under

side is normally china-white with the central parts of the belly and tail tinged yellow, the two shades being divided by a continuous black pencil line each side. This line is diagnostic for this species in our area. The lips and chin are white, with or without spots.

This is an alert diurnal species, moving with great agility. Large individuals need to be treated with respect.

P. punctulatus trivirgatus Peters   Southern Speckled Sand-snake.

This handsome species inhabits drier and lower country than our area, but probably occurs commonly in Masailand between the Kenya highlands and the Meru and Kilimanjaro massives.

It should be readily recognised by its distinctly, black and yellow, banded back and heavily spotted belly. This species is said to reach a good size, an East African record, quoted by Pitman (1938), being 1660 (1080+580) mm.

P. biseriatus Peters.   Eastern Link-marked Sand-snake.

This species is included here because Loveridge (1940) lists it from Arusha and Kilimanjaro mountain. But the general distribution of the species is surely drier and lower country than the area we treat.

As the writer has not seen this species no further details can be given, see Pitman (1938).

Psammophylax tritaeniatus (Gunther)   White-bellied or Striped Grass-snake.

Some confusion has arisen over the East African races of this snake, mainly because of variations in the colour pattern. An unstriped, white bellied subspecies occurring on the Tanzanian-Zambia borderlands was named after the writer *P. t. fitzgeraldi* by Broadley (1960). However, intermediate populations are widespread and so this form no longer has subspecific rank.

Another race having grey under parts, and therefore not qualifying to be called white-bellied, is sympatric with the nominate race and does not integrade. Broadley (1971), therefore considers this to be a good species. This one does not occur in our area.

The race within range of the Kenya-Tanzania borderlands, *P.t. multisquamis* Loveridge, is banded and white bellied, and is distinguished by a larger number of ventral scales, see Pitman (1938) who treats this subspecies under the old generic name of *Trimerorhinus*.

The White-bellied Grass-snake is a delightful and docile, diurnal snake. It is small to medium sized, a measurement of 625 (488+137) mm being large for the species. In the typical form the body is longitudinally banded darker and lighter greyish or brownish. The lower flanks are white with a row of red spots; the under parts are white.

Common, where occurring, amongst ground vegetation in woodlands. Active by day, but retiring; prey frogs, lizards and mice.

Rhamphiophis   Beaked-snakes.

The writer has no records of Beaked-snakes in the area treated. Three species are listed from Kenya and Tanzania, namely *R. acutus* (Gunther), Southern Striped Beaked-snake, *R. rubropunctatus* (Fischer), Red-spotted Beaked-snake and *R. oxyrhynchus* (Reinhardt), Western Brown Beaked-snake. They are all inhabitants of low, sandy, woodland areas, rather than of the formerly forested uplands.

In general they are medium sized snakes growing to 1 metre (rather over 3 ft) in length. *R. oxyrhynchus* is brownish with a distinct dark line through the eye. *R. acutus* is banded. *R. rubropunctatus* is said to be spotted with red, which is the characteristic livery of juveniles of the other species. All are back-fanged but docile and not dangerous.

The diagnostic characteristic of all species is the beak-like rostral which is hollowed out below. The only other snake that has this character is *Scaphiophis* which has already been treated. Apart from colour-pattern differences, it should be noted that in *Rhamphiophis* 1 or 2 upper labials contact the eye which is not separated from them by subocular scales like in *Scaphiophis*. The beak seems to be used for digging into loose sandy soil.

Telescopus semiannulatus (A. Smith) Tiger-snake.

This distinctive species is widespread in East Africa, but occurs mainly at lower elevations than the area treated. It is medium sized. A large individual collected in the Rukwa valley measured 930 (800+130) mm, photo VII.

The body is reddish-pink with a broad black blotch across the neck, and then a series of black blotches all down the back, about 30 on the body and 10 on the tail. The underparts are mother-of-pearl white tinged with pink. The head is broad, the neck distinct, the eye prominent and with a vertical pupil.

The Tiger-snake is nocturnal and rather vicious. Large ones should be treated with respect as they have a poison fang behind the eye in the upper jaw. They are terrestrial but good climbers and feed on small creatures varying from lizards, small birds to mice. One I collected had suffocated itself by trying to swallow a bat.

Thelotornis kirtlandi (Hallowell) Twig-snake or Vine-snake.

A common and widespread woodland species. Like the Boomslang, it is not common in formerly forested areas so may not be encountered around Nairobi; it has not been recorded from Arusha National Park. The Twig-snake is extremely slender but quite long, a good size being 1425 (880+545) mm, or around 4½ ft.

This species is very distinctive but practically impossible to see in the wild due to its cryptic colouration and habit of 'freezing'. The slender body and tail, the latter about 35 per cent of the body length, are intricately marbled all round with greyish and brownish, and speckled and spotted with pinkish and cream. The slender head is ornamented with dark and light colours which form a Y-shaped design on top. The whole effect completely harmonises with the twigs and branch among which Twig-snakes live. Furthermore the narrowly horizontal pupil is the antithesis of a bull's-eye for attracting attention, see fig. 19. The tongue, however, is conspicuous and gaudy, orange and black, and the snake has the habit of extending it to distract the attention of its prey from its own stealthy approach.

When detected these lovely snakes can put up quite a display by inflating the neck and exposing a striking pattern of colours. They have fangs behind the eye and their venom is dangerous. Food largely chameleons.

Elapidae

Elapsoidea sundevallii (A. Smith) Garter-snake.

The Garter-snake is a primitive burrowing cobra which is secretive in habits and rarely seen.

Adults are usually slate grey with a number of lighter coloured transverse pairs of bands across the body which become more apparent when the snake inflates itself. The underside is mother-of-pearl white from chin to tail. The body has a smooth 'oily' appearance. Juveniles are said to be conspicuously banded black or reddish-brown and white.

This is a small species, a length of 483 (445+38) mm, about 18″, being a good size.

Garter-snakes are front-fanged and venomous; but, being of a placid temperament, are not dangerous to human beings. They are nocturnal and likely only to be found by turning over rocks or logs. This species is oviparous; but very little seems to have been recorded about the life history or feeding habits.

Dendroaspis angusticeps (Smith) Green Mamba.

The mamba has the reputation of being the most dangerous snake in Africa, an indictment, however, that most people apply to any snake that they see. Moreover the Green Mamba is less aggressive than the so-called Black Mamba (*D. polylepis* Gunther) for which I have no record in our area.

The two East African mambas are extremely similar in appearance and so records as to which occurs where are often confused. They may be easily distinguished from each other, however, by the characters given in the key.

The Green Mamba is a very slender snake for its length. A good sized individual measures 1860 (1430+430) mm. The head tapers from the massive jowls to the blunt snout; it is flat topped and straight sided, with the supraocular bent sharply to form a a ridge over the eye. The body is green above and paler below, with no pattern; the pupil is circular and the iris dull old-gold colour.

This is an arboreal snake inhabiting forest. It is quite common and widespread and occurs in the Arusha National Park. They feed on birds, eggs and chameleons.

Naja haje (L.) Egyptian Cobra.

This is the common cobra of north Africa and the Sudan and although widespread in East Africa it tends to be found mainly in the drier country. Its distribution is, therefore, rather marginal to the area treated.

It is a typical cobra. It is a big snake, specimens up to 2 m, 6 ft, occur. The body colour varies from light to dark brown with yellowish underparts. Sometimes there is a dark band on the neck. The presence of subocular scales, dividing the eye from the upper labials is the diognostic character for recognising this species of cobra, fig. 16. Cobras rear up and expand the neck to form a flattened hood when in a threatening mood. Photo. xi, shows a water cobra (*Boulengerina*) in display.

This species is seemingly the asp of legend and its venom is dangerous, but the snake is not aggressive.

Naja nigricollis Reinhardt Spitting Cobra.

This is the commonest cobra in the drier parts of the area treated. It is a large, massively-built black snake and a large specimen can measure 2145 (1777+368) mm, just over 7 feet. Spitting cobras are diurnal and in the habit of frequenting farmsteads and chicken runs where they often have a favourite hole in which to live. This snake is therefore seen quite frequently.

It is a fearless creature, rearing up when disturbed, flattening its hood and exposing the shiny, black, ventral scales under the neck. These are usually irregularly-blotched, with dull reddish or whitish markings. The snake faces its antagonist and spits freely, ejecting a fine spray of venom from its grooved fangs by contracting the muscles around the poison glands. The jets are invariably directed at the eyes with forceful suddenness and, as they have a range of between 2-3 metres (according to the size of the snake), it is as well not to tease Spitting Cobras. I often think juveniles, 348 (288+60) mm, even more dangerous. They look innocent—like any other little blackish snake—and yet they can spit with accurate aim, without even rearing up or visibly opening the mouth. The element of surprise in their attack is perfect. Nevertheless, one of these plucky snakes, threatening an aggressor many times its own bulk, is one of the most rewarding sights of the African bush, I think.

Spitting cobras occur commonly at Tarangire and Lake Manyara, but I have not found one in the Arusha National Park.

Viperidae.

Atheris Tree or Bush-vipers.

These beautiful greenish, or variegated coloured, small arboreal vipers present a

bit of a mystery. They are typical tropical African snakes, frequenting forests and swamps. Consequently they tend to occur at the higher elevations where forest predominates, and because relict patches of forest and swamps are discontinuous, so is the distribution of Tree-vipers.

Being cryptically coloured, they are extremely difficulty to see, and so are not well represented in collections. But where occurring they are usually common and, once the collector has got his eye in, not difficult to find. The general conclusion must be therefore, that *Atheris* are very local but widespread in suitable places in East Africa.

As a result of the discontinuous distribution of the genus, several species and subspecies have been described. But due to the usual lack of adequate specimens in museums, the validity of the different forms is sometimes in question. Our interest naturally centres on the new species, *A. desaixi*, described by Ashe (1968) from Kenya.

In general, Tree-vipers are small, the Kenya species is big for the genus with a possible length of 640 mm; a specimen attributed to *A. nitschei* from the southern Tanzania borderlands measured 340 (288+52).

The scales are prominently keeled, the head wide like other vipers and the short tail is prehensile. The colour is usually dark green with dark or yellowish tipped scales forming a pattern, the underparts often being yellowish. De Saix's Bush-viper is seemingly darker coloured than the usual run of *Atheris.*

Tree-vipers are recorded to feed on small mammals and frogs. Though venomous, they have not got a bad reputation; the writer has not heard of anybody being bitten by one. No species of *Atheris* have yet been found in the forests on the volcanic mountains of northern Tanzania. But anyone who finds a new locality for these snakes should report it to the Society as a matter of great interest.

Vipera hindii Boul. Montane-viper.

This is an endemic Kenyan snake occurring only on the Aberdares. The writer has no acquaintance with this species, and comparatively little seems to have been found out about it since it was first discovered in 1910.

Recently taxonomists have merged the genus *Vipera* in *Atheris;* so Montane-vipers now join the Tree-vipers, in a group that needs more study.

Atractaspis bibroni A. Smith Burrowing-viper.

The Burrowing-viper is an enigma. It is a smallish snake, 535 (506+29) mm, or a little over 18 inches, being a good size. It is plain shiny black, or very dark brown, above and below. The head is not distinct from the neck and not as wide as the body; the snout is rather prominent. The top of the head is covered with normal shields. They look, therefore, more like any other small blackish snake, particularly other burrowing kinds, than a viper, see photo. xvi.

Practically every herpetologist, especially beginners, has been taken in. Actually when one is initiated, one realises that the one good viperine character is painfully obvious, and that is the fangs. These are extremely long and project backwards from the corner of the mouth. Therefore the snake can give ones finger an injection without even opening its mouth. The result is nasty and there are reports of fatalities, Corkill (1935).

Recognition characters, apart from the fangs, include the long slender body and very short tail, about $\frac{1}{16}$ of the total length; some or all of the subcaudal scales may be single, refer to figs. 12 and 10. The scales are smooth, varying from 19–23 rows at midbody. Variations in details of scale counts have lead to several species and subspecies being described.

Burrowing-vipers live underground, under stones, etc., and so may be encountered gardening. They feed on burrowing lizards, other burrowing snakes and nestling mice in holes, and such like subterranean prey. They move above ground at night, and sometimes become numbed with cold so they lie on the surface till warmed up again by the sun.

Burrowing-vipers lay eggs, so should not be called vipers at all (viper refers to being viviparous—that is, giving birth to living young). Common in Arusha National Park.

Bitis arietans (Merrem) Puff Adder.

The Puff Adder has the distinction of being the commonest, most widespread and most familar large snake in E. Africa. In consequence of its abundance and almost domestic habits it has the most lethal (or, at least, extremely unpleasant) bites to its debit; and the most noxious rodents swallowed to its credit.

The Puff Adder is easy to recognise. An average large individual measures 1000 (940+60) mm; just over 3 ft. The build is massive, with a wide, spade-shaped head covered with small keeled scales, fig. 10, and a short tail. The colour pattern is variegated yellowish and darker brown. The dorsal pattern consists of a series of V-shaped marks of darker and lighter brown; there is a light yellowish line running between the eyes. The underparts are yellowish-white blotched with blackish. Juveniles are a small replica of adults, but the general tone is pinky-brown with dark amber-brown markings. This juvenile tone may be retained until the individual is nearly half grown.

Puff Adders are mainly nocturnal and terrestrial, but may be found anywhere at any time coiled up under partial cover. The body pattern harmonises so well with ground litter, that there is a real danger of treading on this snake unawares. They are sluggish, moving slowly forward by working the ventral scales. But they can strike with lightning speed. The poison causes disintegration of the blood vessels and extensive haemorrhage. This is a dangerous snake.

Puff Adders are viviparous, that is to say produce living young. A brood may comprise over three dozen, each juvenile being about 180 mm long, and fully equipped with venom ready for its first bite. Young snakes feed on frogs, later graduating to rats.

Occurs at 1500 m altitude in the Arusha National Park.

Bitis worthingtoni Parker Kenya Horned-vipers.

This species was described from Naivasha in 1932. I have not seen one, so have not been able to include this species in the key.

This is a small species, adults measure about 300 mm and the young, which number up to 12 at a birth, about 140 mm. In general appearance, these snakes resemble small Puff Adders with a horn above each eye. Their venom is virulent. It is reported that white mice bitten by Horned-vipers die quicker than those bitten by Puff Adders.

Up-to-date information on the habits and status of this endemic Kenyan snake is needed.

Causus rhombeatus (Licht.) Rhombic Night-adder.

There are four species of night-adders on the East African check-list; but the Rhombic is the commonest in the area treated, photo. xv.

Like the Burrowing-viper, this is not a typical Viperine snake. The top of the head has shields like the Colubrinae; there is no distinct neck and the head is actually narrower than the obese body. They lay eggs, instead of giving birth to living young, like the true vipers.

Night-adders are medium sized, a big one being 710 (630+80) mm, or nearly 3 ft. The large hinged fang in front of the mouth is easy to locate. The colour pattern when present is distinctive, but plain coloured individuals are not uncommon. The ground colour varies from olive-brown, brownish-grey, pale-grey to almost black. There is often a distinct V-mark, opened backwards, on top of the head. All the way down the back, there is a series of dark, white-edged, rhomboid markings; the under parts are ivory-coloured, with or without darker streaks.

The pattern is made up from the dark edges to the body scales which are overlapping. So if the dark edge is covered by the light edge of an adjacent scale, the snake appears

to be plain coloured. But these snakes blow themselves out when threatening and this expands the scales apart, even exposing the underlying black skin. This produces a rather startling effect. Patterned snakes become even more strikingly marked, and a hidden pattern appears on plain coloured individuals. Juveniles vary as much as adults in colour pattern.

Other points to note are that the dorsal scales are feebly keeled, the mid body scale row count varies from 15–19 and the tail is rather short.

Night-adders are nocturnal and terrestrial snakes frequenting wet places, or anywhere else during the rains, where they can find toads to eat. They lie up in any convenient shelter during the day or in dry weather.

Common in the Arusha National Park.

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NOTES ON THE VEGETATION OF THE CHERANGANI HILLS, N. W. KENYA

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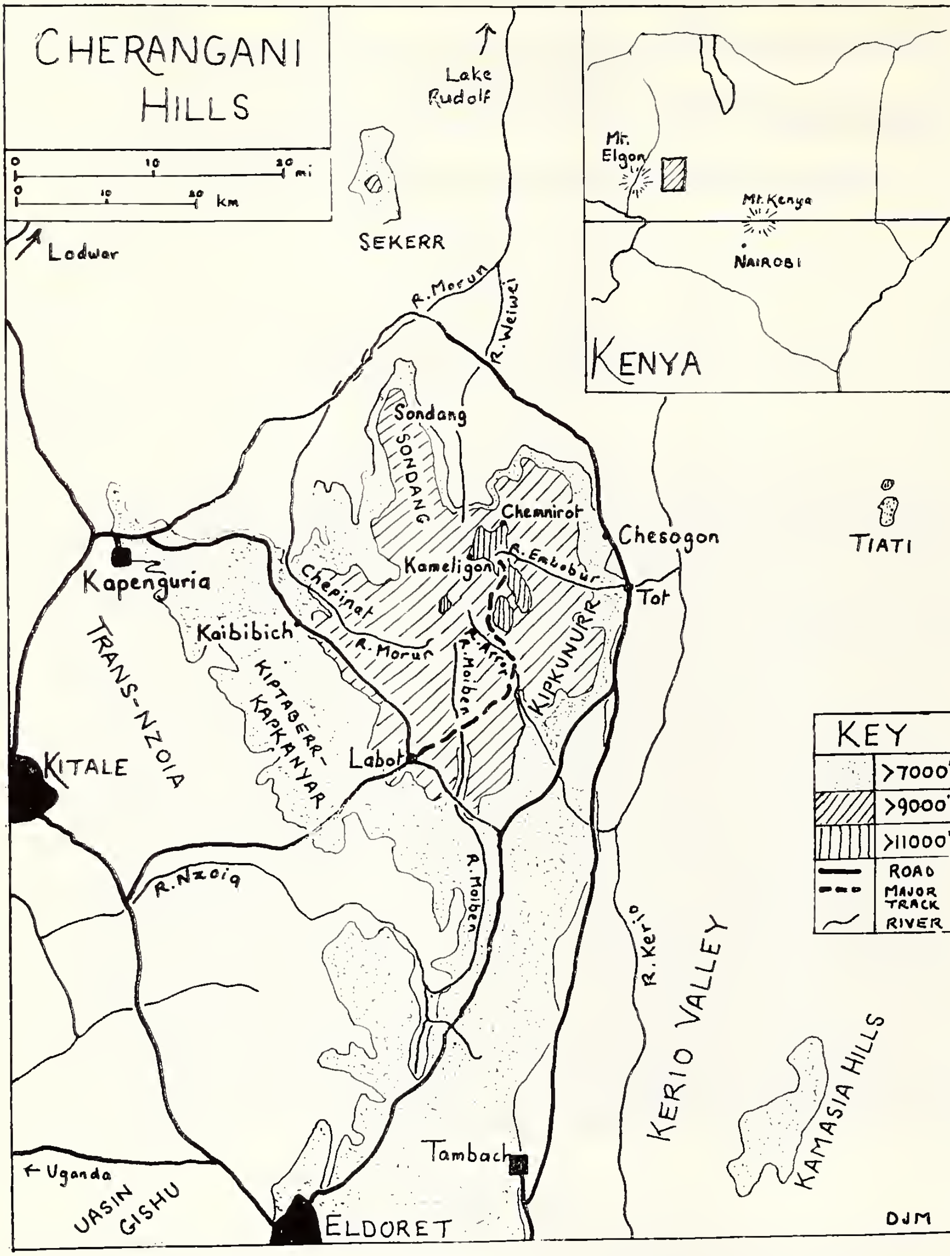
INTRODUCTION

The Cherangani Hills lie in N. W. Kenya, flanked by the Trans-Nzoia and Mt. Elgon to the west, and to the east by the Eastern Rift Valley, of which they form the Marakwet escarpment above the Kerio Valley (Fig. 1). They are composed of metamorphic rocks with conspicuous quartzite ridges and occasionally marble veins, unlike the other Kenyan Highlands which are relatively recent volcanics. The Cheranganis reach to little under 12,000′ (c. 3,600 m) at Chemnirot in the north-east, but it is because of their relatively low altitude when compared with these others that Hedberg (1951) omitted them from his studies on the vegetation belts of the East African mountains. Although considerable collections of herbarium material have been made (see Hedberg, 1957), there are few published accounts of the vegetation of the Hills. In their paper on the Giant Groundsels, Cotton and Blakelock (1937) described the swampy areas of the north-east from I. R. Dale's notes; Jeannel (1950) outlined the associations of the secondary grasslands of the south-east, but, apparently unaware of Cotton and Blakelock's work, stated that there were no Giant Groundsels in the Hills. Unwin-Heathcote and Carson (1951) described the vegetation of the south-western area through which the 'Cherangani Highway' was built. A description of a swamp in this area is provided by van Zinderren Bakker (1964). In the light of the poor documentation of the area, an expedition from Oxford visited the Hills for three months in the summer of 1969 with a view to surveying them with regard to their possible conservation. This had been mooted in Kenya by biologists and local farmers, for the Cheranganis comprise one of the few Kenyan haunts of the Bongo antelope (*Boocereus eycereus* Ogilby) and are the only location for certain plants, notably the Giant Groundsels *Senecio johnstonii* Oliv. ssp. *cheranganiensis* (Cotton & Blakelock) Mabberley and *S. johnstonii* Oliv. ssp. *dalei*, (Cotton & Blakelock) Mabberley, although endemism in the Cheranganis is not as spectacular as on the higher mountain masses of East Africa.

PHYSIOGNOMY

To the west, the higher peaks of the Sondang and Marakwet Hills are flanked by the Kiptaberr-Kapkanyar shelf at c. 7,500′ (2,300 m), which receives a good deal more rain than the eastern escarpment, due to prevalent winds from Lake Victoria. Above 9,500′ (c. 3,000 m) frost was experienced most nights (July-September), and hail

Fig. 1. The Cherangani Hills.



frequently fell on forested land as low as 7,500′ (2,300 m). The eastern slopes of the Hills are heavily populated, despite their great steepness; the western slopes are more gentle and compose the area for which a National Park had been suggested. The vegetation of the western slopes from the Kiptaberr-Kapkanyar shelf to the highest peaks was therefore studied and a short tour of the eastern regions made later for comparison. Three forest 'types' were studied in detail by means of 200 m line transects, and floristic studies of all vegetation 'types' made. Each of the transects resulted in the production of a profile which straddled a stream, and the three are therefore somewhat comparable as 'montane riverine forests'.

There is considerable concern over the increased grazing pressure leading to exploitation of areas further up the valleys, forest-clearing and extensive erosion with detrimental effects on the Uasin-Gishu Plateau to the south-west, for part of which the Cheranganis act as a watershed. Consequently, the expedition included a geomorphologist besides biologists, to estimate the effects of land use by the local people, the Pokot to the west, and the Marakwet to the east.

VEGETATION DESCRIPTION

An outline of the floristics of the Hills can help to build up a picture of the vegetation of the region which may thus be compared with the studies of Hedberg.

Forest I—Kiptaberr-Kapkanyar

Lying on a plateau above the Trans-Nzoia region of cultivation and *Acacia* savannah types at 7,500–8,000′ (2,300–2,500 m), this forest was studied by means of a line transect, the elements of which are described below.

(a) *Clearings (shambas)*

A few scattered *Acacia abyssinica* Benth. trees dominate a scrubby grassland characterised by *Rhamnus sp.*, *Echinops amplexicaulis* Oliv. and coarse grasses mixed with a large number of herbaceous dicotyledons: *viz. Geranium sp.*, *Lobelia holstii* Engl., *Lightfootia cartilaginea* Scott, *Alchemilla volkensii* Harms, *Hypericum peplidifolium* A. Rich., *Oldenlandia monanthos* Hiern, *Berkheya spekeana* Oliv., *Trifolium cheranganiense* Gillett, etc. and monocotyledons characteristically Commelinaceae. Conspicuous plants in shorter cattle-grazed areas are the succulent *Kalanchoe densiflora* Rolfe and *Crassula alba* Forsk., the cormous *Romulea campanuloides* Harms, *Oxalis obliquifolia* Steud., and *O. corniculata* L., various Labiate shrubs, the dwarf *Cassia usambarensis* Taub. and the remarkable rosetted 'Resurrection Plant' *Craterostigma pumilum* Hochst., and on eroded quartzite outcrops, *Aeolanthus repens* Oliv. and *Solenostemon latifolius* (Hochst.) J. K. Morton. In the north, near Kapenguria, extensive pine plantations have been established on such outcrops.

(b) *Grassland-forest ecotone*

The forest is edged with *Acacia abyssinica*, *Hypericum revolutum* Vahl, *Rapanea rhododendroides* (Gilg) Mez, *Faurea saligna* Harv., *Hagenia abyssinica* (Bruce) J. F. Gmel., and occasionally *Cussonia spp.* and other sclerophyll shrubs, e.g. *Rhamnus sp.* and there is a remarkable number of species forming a tangled mat of vegetation suspended from these, *viz. Clematis simensis* Fres., *Rubus sp.*, *Ipomoea tenuirostis* Choisy, *Impatiens papilionacea* Warb., *Bidens kilimandscharica* (O. Hoffm.) Sherff, *B. elgonensis* (Sherff) Agnew, the parasitic *Tapinanthus woodfordioides* (Schweinf.) Balle, *Dolichos sericeus* E. Mey., *Viola abyssinica* Oliv., *Caucaulis incognita* Norman, *Sparmannia ricinocarpa* (Eckl. & Zeyh.) Kze., *Thunbergia alata* Sims, etc.

(c) *Forest interior*

(i) Dry areas. Unlike the forests to the south-west and east of the 'Cherangani Highway', the forests of the north-west are dominated not by *Podocarpus milanjianus* Rendle alone but this species is accompanied by *Dombeya goetzenii* K. Schum. and *Syzygium*

guineense (Willd.) DC. and other tall evergreen species. The undergrowth is predominantly acanthaceous—the prickly *Acanthus eminens* C.B.Cl. reaches 5 m as does *Mimulopsis sp.*, overtopped by the euphorbiaceous *Macaranga kilimandscharica* Pax and *Neoboutonia macrocalyx* Pax. Beneath this layer, more acanthaceous species including *Justicia* spp. and the amaranthaceous *Achyranthes aspera* L. are found with many plants in genera familiar to 'temperate' botanists—*Sanicula elata* D. Don, *Cardamine africana* L., *Thalictrum rhynchocarpum* A. Rich., besides *Impatiens papilionacea*. The grasses predominate in more open areas especially near paths and the most important are *Panicum calvum* Stapf and *Oplismenus compositus* (L.) Beauv.

(ii) Streamside and 'wet' areas. These are dominated by the tree fern *Cyathea manniana* Hook.f. Important herbs are the giant sedge *Cyperus dereilema* Steud., *Desmodium repandum* (Vahl) DC. *Adiantum sp.*, *Plantago palmatum* Hook. f., *Impatiens spp.*, and many epiphytic ferns—*Asplenium spp.*, *Pleopeltis excavata* (Bory) Moore, *Loxogramme lanceolata* (Sw.) Presl, being most common. The filmy fern *Trichomanes melanotrichum* Schlecht. covers the fallen timber and the whole epiphytic flora is rich including the large lichen *Lobaria natalensis* Ras., many bryophytes, *Peperomia spp.* and orchids—mainly *Aerangis* and *Tridactyle spp.*

To the west of the Cherangani Highway the forest is dominated by *Podocarpus milanjianus*; *Cyathea manniana* Hook. f. and the pachycaul *Lobelia giberroa* Hemsl. are conspicuous. This forest is extremely moist and whilst working there, we suffered torrential rain each afternoon with tiresome regularity. Parts of this forest near streams are impenetrable except by following stream-beds.

To the east of the Cherangani Highway, the Chepinat Valley holds a forest of similar nature, but it is dominated mainly by *Podocarpus milanjianus*. A tongue of this forest, grazed through and in a depauperate state reaches over 8,500′ (2,700 m) at Kaibibich. Conspicuous features of this forest which is very dense in parts, include the very tall *Podocarpus* and *Euphorbia obovalifolia* A. Rich. in the interior and an abundance of the monocotyledonous tree *Dracaena afromontana* Mildbr. Very common here is the giant *Lobelia giberroa*, its stalk often grazed, the leaves left in a neat pile, indicating the presence of Bongo, (R. W. Wrangham, *in litt.*).

Thickets of bamboo are sometimes seen in the Kapkanyar and Chepinat, also along roadsides and in clearings of the more disturbed forest around 9,000′ (2,800 m). The distribution of bamboo is a vexing problem, for, like Kilimanjaro (Hedberg 1951), the Hills have no distinct bamboo zone at the present time, comparable with that on e.g. Mount Kenya. Near Kiptaberr ('Lion Rock', 'Pope's Nose'), an isolated hill rising from the forest, a wide belt of bamboo encircles much of the base (7,500′) (2,300 m) but it is found in its most vigorous state at 11,000′ (3,300 m) in mixed forest, reaching 12 m with stems 15 cm in diameter.

Above the Kapkanyar and Chepinat, the Hills are much cultivated and the forest rather scrappy—relict *Podocarpus* stands are found and further south-east, *Juniperus procera* Endl., especially on the road to Sondang. However, the conspicuous tree is *Hagenia abyssinica*. This forms small stands and copses, sometimes with *Hypericum spp.*, *Gnidia spp.*, and *Olea spp.* throughout the sheep-grazing area near Kipsait, extending to Kaptalamwe and Kamyatatyang and the hilltops of the Sondang and Marakwet ridges, where moorland takes over. The other feature of this intermediate zone is the presence of *Senecio johnstonii* ssp. *cheranganiensis* swamps. Here, the higher montane species of *Kniphofia*, *Lycopodium* and orchids, e.g. *Habenaria* spp. are common (a phenomenon also observed in Madagascar by Humbert & Cours Darne, 1965). However, other spectacular orchids of the terrestrial genera *Disa*, *Satyrium*, and *Habenaria* colour the swamps.

Some ecological change appears to have taken place in these swamps for no regeneration of the Giant Groundsels is occurring. No seedlings could be found, and this was in complete contrast with their abundance at higher altitudes. It must be noted that the

Senecio is a forest plant at higher altitudes and the seedlings grow in dense shade there (Mabberley, 1971a); but even at that altitude, it is subject to fire damage (Mabberley, 1973).

The open grazed country straddles the watersheds of the Rivers Morun and Moiben. It is notable that small groups of regenerating *Juniperus* are to be found around old trees, (Fig. 2), suggesting a reduction in the former grazing pressure. With increasing altitude, *Juniperus procera* is more abundant. As one ascends the Sondang Hills, a heath vegetation appears, alternating with swamps. This lower heath appears to be secondary and suffers burning and grazing though aged *Hagenia* trees are often seen. Such observations on vegetation belt depression have been made by Humbert (1965) in Madagascar. The flora is very colourful and there is a good deal of parallel evolution to the ericoid habit—*Erica* and *Philippia spp.* (Ericaceae), *Struthiola* (Thymelaeaceae), *Euryops* and *Stoebe* (Compositae), *Anthospermum* (Rubiaceae), *Selago* (Selaginaceae), *Hebenstretia* (Scrophulariaceae), *Cliffortia* and *Alchemilla* (Rosaceae). Familiar colourful 'garden genera' include *Gladiolus*, *Delphinium*, *Arabis*, *Helichrysum*, *Anemone*, *Clematis* and *Kniphofia*. The swamps contain *Senecio johnstonii* ssp. *cheranganiensis* and the pachycaul *Lobelia aberdarica*, but at higher altitudes on the Sondang Hills, *S. johnstonii* spp. *cheranganiensis* is confined to the swamp margins and 'forests', the swamp itself being occupied by the cabbage-like *S. johnstonii* ssp. *dalei* (c.f. Cotton & Blakelock, 1937). This was seen only in three swamps on the Sondang Hills and three on the Marakwet (Mabberley, 1971a). The tussocks of *Festuca sp. Carex sp.*, and *Deschampsia sp.* make passage to the centre of these swamps possible. In contrast with Mount Kenya, the dwarf *Senecio* first appears at altitudes greater than that where the tree-like *S. cheranganiensis* does (c.f. *S. brassica* R. E. & Th. Fr. and *S. keniodendron* R. E. & Th. Fr. on Mount Kenya). The valleys contain some relic forest characterised by *Rapanea rhododendroides* and *Afrocrania volkensii* (Harms) Hutch., grazed but containing *S. johnstonii* ssp. *cheranganiensis* surrounded by the higher heaths.

The road to the Kameligon area passes through the lower type of heath vegetation before reaching magnificent stands of *Juniperus procera* in the Arror Valley.

Forest II—Arror Valley

The transect lay in a valley between high ericoid vegetation as described below (Kameligon) but the undergrowth is rich in *Lycopodium clavatum* L. The forest (Fig. 3) is composed of tall *Juniperus procera* with occasional specimens of *Hagenia abyssinica*. The undergrowth is not thick but one common shrub, *Myrsine africana* L. may reach 150 cms. The field layer is dominated by *Streblochaete longiarista* (A. Rich.) Pilg. and *Sanicula elata* but *Parochetus communis* D. Don., *Impatiens spp.*, *Lobelia sp. nov.* and *Viola eminii* (Engl.) R. E. Fr. are common, and near the stream, *Cyperus spp.* and *Plectranthus* shrubs etc. are found.

Above this region, on the Kameligon plateau, the ericoid vegetation reappears but is intedigitated with *Senecio johnstonii* ssp. *dalei* swamps and *Rapanea-Hagenia-Senecio-Maytenus* forest.

Forest III—Kameligon

This valley of mixed forest had good stands of regenerating *S. johnstonii* ssp. *cheranganiensis* with *Cliffortia nitidula* (Engl.) R. E. & Th. Fr. at the streamside whilst the valley continued beyond, much grazed and recently burnt but with regenerating *Hagenia*, following *Stoebe-Erica* edged with a zone of *Cliffortia*. The transect included the following:

(a) *Forest*

This is of low woodland atmosphere and dominated by *Maytenus undata* (Thunb.) Blakelock, *Rapanea rhododendroides* and *Afrocrania volkensii* at the top

of the valley wall. Passing down the valley, *Hagenia abyssinica* becomes of more importance, but as it becomes wetter, a mixture of *Senecio johnstonii* ssp. *cheranganiensis* and *Cliffortia nitidula*, with little undergrowth, (Fig. 4) predominates. At the streamside and in swamps nearby, *Lobelia aberdarica and Festuca sp.* are common, growing with *Helichrysum spp.* and *Disa stairsii* Krzl.

The field layer of this forest is lower than in Forest I and is composed of small shrubs and grasses with an occasional specimen of *Lobelia giberroa. Cyperus spp.* abound in moist areas, and the familiar montane forest genera *Impatiens* (*I. rubromaculata*), *Sanicula elata*, *Viola eminii*, *Alchemilla rothii* Oliv., *Lobelia sp. nov.*, and *Luzula johnstonii* are found. The shrubs include *Vernonia* and *Plectranthus spp.* and *Sparmannia ricinocarpa*. At pathsides, *Stellaria sennii*, *Cerastium spp.*, *Galium hamatum* A. Rich., and the most common grass *Streblochaete longiarista*, *Anthriscus sylvestris* (L.) Hoffm., and *Pteridium aquilinum* (L.) Kuhn are particularly abundant.

(b) *Burnt-over area*

The dead trunks of *S. johnstonii* ssp. *cheranganiensis* and the burnt stems of *Cliffortia nitidula* stand over a low vegetation of shrubs and herbs. In wet areas, there are stands of *Rumex bequaertii* De Wild. with *Ranunculus spp.* and occasionally *Carduus nyassanus* (S. Moore) R. E. Fr., *Gladiolus watsonioides* Bak., *Kniphofia sp.* and *Lobelia aberdarica* in moister areas. The common shrub is the composite *Euryops brownei* S. Moore, but other ericoid plants are common—*Hebenstretia dentata* L. and *Selago thomsonii* Rolfe. The everlastings, *Helichrysum kilimanjari* Oliv. and *H. meyeri-johannis* Engl. and *Plectranthus spp.* and the occasional tussock of *Anthoxanthum nivale* K. Schum. with mats of *Arabis alpina* L. complete the upright vegetation. However, the ground is coated with a solid mat of vegetation, predominantly the yellow-flowered *Guizotia reptans* Hutch. but also *Cotula abyssinica* A. Rich. and *Anthemis tigreensis* A. Rich.

(c) *The swamp*

This area is dominated by tussocks of *Carex sp.* and *Festuca sp.* and the cabbage-like *Senecio johnstonii* ssp. *dalei*, but *Alchemilla spp. Phyllanthus boehmii* Pax and *Helichrysum spp.* are very common. *Lobelia aberdarica* and *Lycopodium saururus* Lam. are conspicuous features. The large stemless composite *Haplocarpha rueppellii* (Sch. Bip.) Beauv. is common on higher ground. Colourful species include *Erica whyteana* Britten ssp. *princeana* (Engl.) Hedb., *Hesperantha petitiana* (A. Rich.) Bak. var. *volkensii* (Harms) Foster and *Anemone thomsonii* Oliv.

(d) *Moorland areas*

Both in the Arror Valley and near Kameligon these are secondary with relict *Hagenia* etc., as is the grassland in the floor of the former. Typically, paths of short grass meander between raised ground (in the Arror Valley, ancient frost hummocks), clothed in taller vegetation. *Cliffortia nitidula* predominates; *Erica arborea* L., *Philippia sp.*, *Euryops brownei*, *Anthospermum usambarense* K. Schum., *Stoebe kilimandscharica* O. Hoffm., *Selago thomsonii* and *Hebenstretia dentata* make up the ericoid vegetation which is undergrown with a bewildering number of *Alchemilla* spp., the shrubby species being *A. argyrophylla* Oliv. and *Artemisia afra* Willd. The ground is often covered with the rosettes of *Haplocarpha* and *Guizotia*. In temporary shallow ponds, the attractive *Lobelia minutula* Engl. and *Anagallis serpens* DC. ssp. *meyeri-johannis* (Engl.) P. Taylor form a tight carpet studded with the large tussocks of *Festuca* sp. The common grass in this area is *Deschampsia* sp. Conspicuous plants of the hummocks are *Kniphofia snowdenii* C. H. Wright, *Scabiosa columbaria* L. which is not a calciphile as it is in Britain, *Delphinium macrocentrum* Oliv., *Swertia kilimandscharica* Engl. and in the Arror Valley *Gladiolus natalensis* (Eckl.) Reinw. ex Lodd. Between hummocks in the latter, the small *Swertias*, *S. usambarensis* Engl., *S. lugardae* Bullock, and *S. crassiuscula* Gilg, and the rosetted *Haplosciadium abyssinicum* Hochst. (Umbelliferae) are found in the turf.

Fig. 2 Regeneration of *Juniperus procera* near Kaptalamwe, 2750 m, 2 Jan 1971.

Fig. 3. *Juniperus-Hagenia-Senecio* forest in the Arror Valley, 3050 m, 4 Jan 1971

Fig. 4. *Senecio-Cliffortia* woodland. Embobut Valley, 3150 m, Aug 1969.

Fig. 5. Vegetation stripes near Chemnirot, 3450 m, Aug 1969.

Fig. 6. *Lobelia elgonensis* (*Mabberley & McCall* 186) at Chemnirot, Aug 1969.

Fig. 7. Forest-edge with emergent *Euphorbia obovalifolia*, Marakwet Escarpment c., 2300 m, Aug 1969.

Fig. 9. Cutting for the Chesogon Road in bamboo forest, near Kameligon, 3000 m, Aug 1969.

Above 11,000′ (3,300 m.) the heath is more open and corresponds with the ericaceous zone of Mt. Kenya (Hedberg 1951). *Erica arborea* is common and *Adenocarpus mannii* (Hook. f.) Hook. f. and *Protea kilimandscharica* Engl. at their best. The heath, alternating with low composites etc., picks out the ancient periglacial stripes on the hillsides (Fig. 5). Of the swamps at this altitude, one in the whole range contained a population of a giant *Lobelia* in the *Deckenii* series. Of species so far known each is endemic to one mountain as a rule (Hedberg 1969). Thus this population is of distinct interest, and occurs in a remote region near Chemnirot. It has been identified as *L. elgonensis* R. E. & Th. Fr. jr. and Chemnirot is its only known location away from Mt. Elgon 65 miles (100 km) to the west. (Fig. 6).

To the east of the Hills, the escarpment[1] rises dramatically from the Kerio Valley in the Rift, and the road follows secondary *Acacia* scrub to 8,000′, (2440 m) passing into mixed *Euphorbia* forest with *Juniperus procera* and further south *Podocarpus gracilior* Pilg.-*Euphorbia* with massive *Olea welwitschii* (Knobl.) Gilg & Schellenb. in the Kipkunurr Forest (Fig. 7). Eventually a parkland vegetation formed by clearing and grazing characteristically with relict *Hagenia* etc. is reached. Open sheep country reappears before one descends to the corn clad Uasin Gishu Plateau.

VEGETATION BELTS

Thus, compared with e.g. Mt. Kenya, the altitudinal 'zonation' is present but much obscured. Taking the highest altitude reached by each 'association' we have the series *Acacia* savannah-*Podocarpus-Juniperus-Hagenia-Hypericum*-Ericaceous belt (Fig. 8). Thus, as Coe (1967) points out, the Cheranganis are too low for alpine Grassland, the grasslands present manifesting the effects of man and his herbivores. Factors in obscuring the 'zonation' may be one or some of the following:

(i) The varied topography of the Hills. There is no main peak but a series of ridges and valleys, which on Mt. Kenya introduce local vegetation belt interdigitation;

(ii) The period of cultivation and grazing seems to cover at least a century and many of the communities are secondary, some of which are certainly fire-induced;

(iii) The rocks are metamorphic and not igneous like those of the other Kenyan highlands.

Each of these may be of importance, but without a study of several years involving work on succession, none can be ascribed as the most important.

CONSERVATION

Botanically speaking, it is almost too late to conserve much of the vegetation of the Cheranganis. However, the more or less 'undisturbed' areas are still of interest and beauty; they may be conveniently divided into two areas:

(a) *Kiptaber-Kapkanyar forest*

If this forest with its wealth of tree-ferns and orchids were destroyed, not only would a fine stretch of *Podocarpus* forest of botanical interest be lost, but the water-supply to the west may be endangered through the loss of its catchment area forests, a fact which has made the headlines of the national press (Parry, 1970). The valley of the Kabolet river is of particular importance in having a very high rainfall (in excess of 100″ (2,540 mm) p.a.) compared with the surrounding forest, and its floral composition reflects this. Ground which has already been cleared, notably near Kiptaberr peak, bears a wide range of terrestrial orchids for which the area is noted.

[1]First described after Teleki's Lake Rudolf Expedition passed in July, 1888 (von Höhnel. 1894:268)

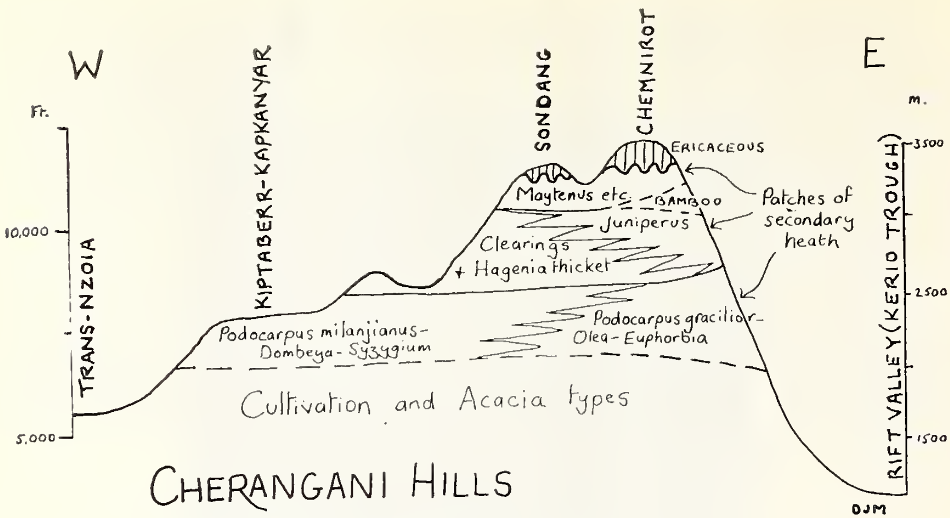


Fig. 8 Profile of Vegetation Belts; modified from Mabberley (1971b).

(b) *The high altitude moorlands and peaks*

This area is bounded by the peaks Kalelaikelat, Chepkotet, Chesugo Peak, 76S2 and Kalelaikelat. This covers the best *Juniperus* forests in the Arror Valley, an impenetrable bamboo belt to the north-east (Fig. 9) and the curious high altitude mixed *Hagenia-Maytenus* forest, giving way to the ericaceous belt above. The best stands of the Giant Groundsels and Lobelias are included.

These two areas have much to commend them. A road north-south through the centre of the Kiptaberr-Kapkanyar was almost completed by the British administration and could be re-opened fairly easily. Similarly, a road from Labot to Chesegon through the peaks area is under Forest Dept. construction. Access is thus not a great problem. The first area contains the remaining nuclei of game (Wrangham *et al*, 1971), which once unmolested, might refill the forest. Secondly, the River Kabolet holds good fishing and has convenient camp-sites etc.

The second contains that forest where there is the remnant of the elephant herd, which until 1955 was found throughout the area. It also includes the highest peaks—Kameligon and Chemnirot, with splendid views over the dry country to the north-west and north, and to Lake Baringo in the east. In this area are the peculiar periglacial hummock and stripe vegetation formations near Chemnirot, and there is evidence at Kalelaikelat of ancient occupation by the Sirikwa people, the alleged burial mounds of whom occur on the nearby peak, Kaisungor.

As the Kiptaberr-Kapkanyar is composed of National Forest and thus should not be populated, it would be reasonable to suggest the status of National Park for it, whereas the other area is more problematical in being composed of lands of varying status. Perhaps 'Nature Reserve', as was suggested for the Cherangani Forests in 1958 (Verdcourt, 1968), would be more suitable.

APPENDIX

(i) Plants listed as afroalpine by Hedberg in Afroalpine Vascular Plants (1957) but not recorded by him from the Cheranganis. The numbers in parentheses refer to the collecting numbers, 1-316 of Mabberley & McCall, and Nos. 317-600 of *Mabberley* only:

Lycopodium saururus Lam. (185), Lycopodiaceae
Poa schimperana A. Rich. (508), Gramineae
Calamagrostis hedbergii Meld. (501)
Agrostis gracilifolia C. E. Hubb. (499)
Luzula johnstonii Buchenau (193), Juncaceae
Kniphofia rogersii E.A. Bruce (170), Liliaceae
Romulea fischeri Pax, Iridaceae
Hesperantha petitiana (A. Rich.) Bak. var. volkensii (Harms) Foster (286)
Dierama pendulum (L. f.) Bak. (163)
Gladiolus watsonioides Bak. (223)
Stellaria sennii Chiov. (203) Caryophyllaceae
Delphinium macrocentrum Oliv. (235), Ranunculaceae
Anemone thomsonii Oliv. (233)
Ranunculus volkensii Engl.
R. oreophytus Delile
Thlaspi alliaceum L. (258), Cruciferae
Arabis alpina L. (211)
Sedum ruwenzoriense E. G. Bak. (230, 304), Crassulaceae
S. meyeri-johannis Engl. (484)
Alchemilla ellenbeckii Engl. (281), Rosaceae
A. argyrophylla Oliv. (282)
Geranium arabicum Forst. (196)—'G. simense' in Hedberg, 1957, Geraniaceae
Oxalis corniculata L. (44), Oxalidaceae
Euphorbia wellbyi N. E. Br. (254), Euphorbiaceae
Callitriche stagnalis Scop. (568), Callitrichaceae
Hypericum keniense Schweinf., Hypericaceae
H. kiboense Oliv. (582)
Anthriscus sylvestris (L.) Hoffm. (200), Umbelliferae
Haplosciadium abyssinicum Hochst.
Pimpinella kilimandscharica Engl. (590)
Peucedanum kerstenii Engl.
Sebaea brachyphylla Griseb. (587) Gentianaceae
Swertia lugardiae Bullock (262)
Lithospermum afromontanum H. Weim. (253), Boraginaceae
Celsia brevipedicellata Engl. (243), Scrophulariaceae
Limosella africana Glück (570)
Hebenstretia dentata L. (252)
Sibthorpia europaea L. (575)
Bartsia longiflora Benth. (299)
Galium ossirwaense K. Krause (502), Rubiaceae
G. glaciale K. Krause (518)
Dipsacus pinnatifidus A. Rich. (260), Dipsacaceae
Scabiosa columbaria L. (250)
Wahlenbergia pusilla A. Rich. (500), Campanulaceae
W. arabidifolia (Engl.) Brehm. (310)
Lobelia elgonensis R. E. & Th. Fr. j. (186),
Monopsis stellarioides (Presl) Urb. var. *schimperana* (Urb.) Wimmer
Helichrysum kilimanjari Oliv. (218), Compositae
H. nandense S. Moore (244)
H. meyeri-johannis Engl.
H. guilelmii Engl. (571)
Bidens elgonensis (Sherff) Agnew (6)—'Coreopsis elgonensis' in Hedberg, 1957
Anthemis tigreensis A. Rich. (214)
Cotula abyssinica A. Rich. (216)
Artemisia afra Willd. (241)
Cineraria grandiflora Vatke (196)
Senecio schweinfurthii O. Hoffm. (256)
Euryops elgonensis Mattf.
Haplocarpha rueppellii (Sch. Bip.) Beauv.
Carduus keniensis R. E. Fr. (212)

(ii) Records of phytogeographical interest, etc.
Calamagrostis hedbergii Meld. (501), Gramineae—previously known only from a single plant on Mt. Kenya, (Hedberg, 1957).
Calanthe volkensii Rolfe (49, 486), Orchidaceae—first Cherangani records.
Holothrix elgonensis Summerh (224)—first non-Elgon record.
Lobelia elgonensis R. E. & Th. Fr. jr. (186), —first non-Elgon record.
Lobelia sp. nov. (236)—dominant carpeting herb in *Hagenia-Maytenus* forest.

Further details of the distribution, ecology and cultivation of these 'afroalpines' are to be found in Mabberley, 1971c & 1972.

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ECOLOGY OF THE LOWER TANA RIVER FLOOD PLAIN (KENYA)

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INTRODUCTION

The Tana River is the longest river in Kenya. From its sources on Mt. Kenya and the Aberdares to its present mouth at Kipini on the Indian Ocean is a straight distance of 480 km and 800 km following the major directional curves. But a measurement along the numerous meanders of the lower course would yield a length at least double this (see Fig. 1).

In its upper course the Tana flows north, but soon turns south by south-east, which is its direction until it reaches the sea. The limit of the Upper Tana is taken as the Hargazo Falls, which are situated at about the point where the river turns south. It is this part of the river which receives all the tributaries, the last to enter the river being the MacKenzie, which joins it 58 km above the Falls. Only during high flood years does water from other rivers, such as the Tiva, enter the Tana. Thus the river gains no new water in its middle and lower courses, but loses water continuously through evaporation.

In its lower reaches the Tana flows through a broad flood plain. The entire area is covered by recent alluvial sediments brought down and deposited during the annual floods of the river. The flood plain is primarily grass-covered but there are numerous patches of forest and woodland that are apparently edaphic in origin, depending either on the flooding or on the high water table in the flood plain or both.

The forests of the Lower Tana River are the home of two endemic subspecies of primate: the Tana River Red Colobus (*Colobus badius rufomitratus*) and the Tana River Mangabey (*Cercocebus galeritus galeritus*). These are both listed in the *Red Data Book* as endangered. Almost nothing has been recorded of their distribution, status, ecology, and behaviour. The primary purpose of this investigation was to study their distribution

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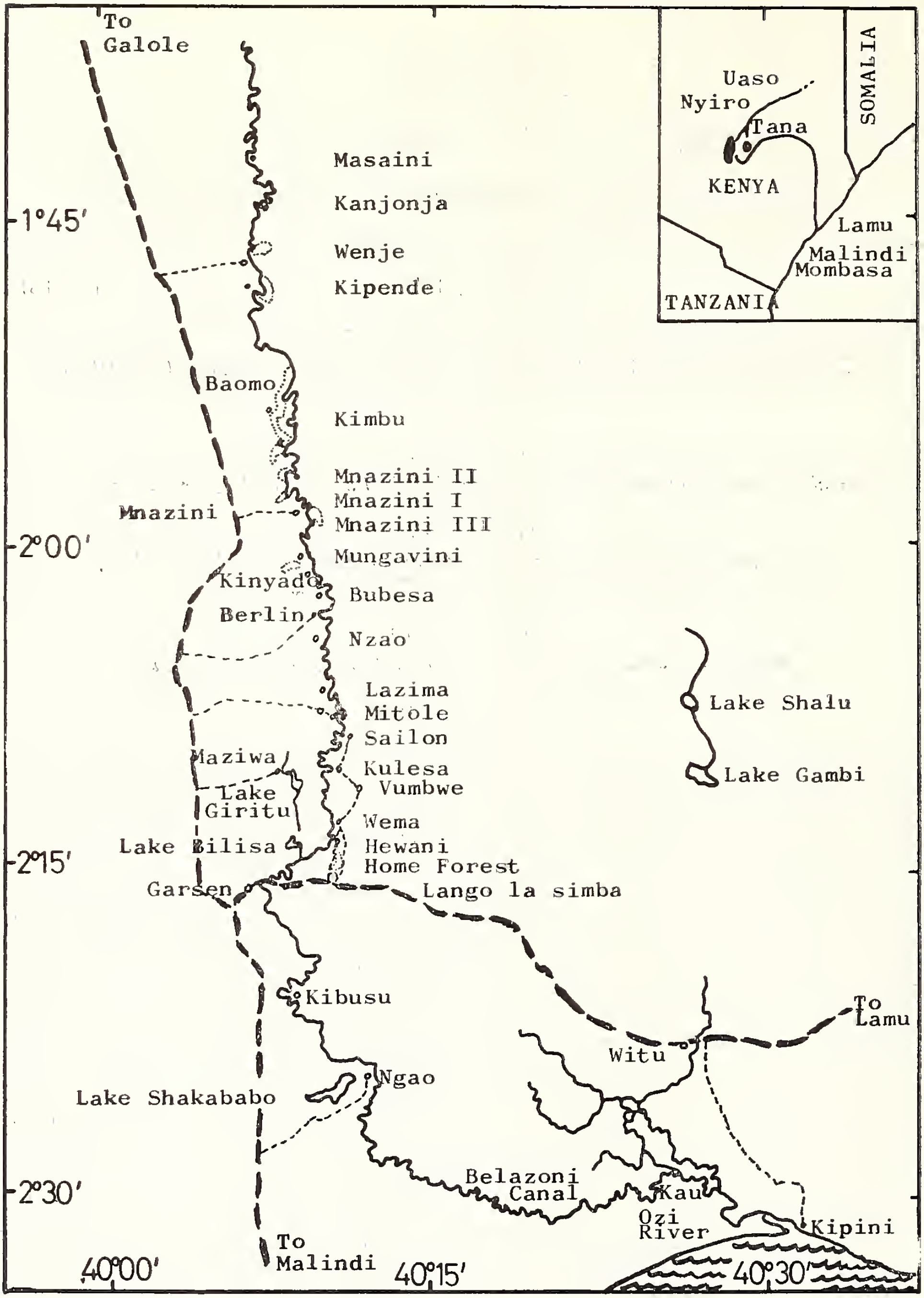

Fig. 1. The Lower Tana River, showing the northern forests of the 1972 expedition. Heavy dotted lines are roads; smaller dotted lines are tracks.

and status with reference to the ecology and fauna of the region. The closest relatives of both monkeys are to be found in the Central African forests, posing striking zoogeographical problems. The ecological survey was therefore undertaken from a problem orientation, as well as a purely descriptive one.

This survey took place in July and August 1972. The feasibility of such a survey was investigated by preliminary visits in 1971 and 1972. We saw colobus in one forest in August 1971, and both colobus and mangabeys in three different forests in February 1972. T. T. Struhsaker visited the area in November 1971, finding mangabeys and colobus in one forest and mangabeys in another. The present survey owes a lot to his encouragement. These initial investigations confirmed that the animals could be found if searched for and that the area was not totally uninhabitable by a scientific team.

METHODS

The authors set up a camp on the Tana River, near Hewani (approximately 02°15′S, 40°10′E). The camp was near a large forest, hereafter called the "Home Forest", along a former river course (see Fig. 2). Almost daily visits were made into this and the nearby Hewani forests, mostly in the early morning and towards evening. Several day-long visits were made to localities upriver. Members of the expedition also made three longer safaris (see Fig. 1):

1. on the right bank as far up as Garissa, crossing the river and going down the left bank as far as Bura;
2. on the right bank to Mnazini and Baomo;
3. and on the right bank downriver to Ngao.

Data on birds and large mammals, including colobus and mangabey, were collected primarily from observations of C. P. Groves. Mistnets were also set up within the Home Forest, and birds caught in them were identified by J. F. M. Horne and measured, then released (a few, however, were collected). Small mammals were trapped by P. Andrews and J. Kinyanjui, mostly in live-traps (wooden live-traps measuring 7 × 8 × 15 cm were used, supplemented on occasion by break-back traps of three different sizes), and either collected or released. Trapping was done for two months in July-August in the Home Forest, Hewani IV and Mnazini I (see Fig. 2). A number of soil pits were dug, under the direction of P. Andrews, and soil samples from them were analysed by the National Agricultural Laboratories, Nairobi. The vegetation was recorded by P. Andrews, and we had the benefit of the five day visit from J. B. Gillett and S. Kibua of the East African Herbarium. The small mammals collected were identified with the help of I. S. Aggundey, and the birds with the help of A. Forbes-Watson, both of the National Museums of Kenya.

We had the assistance of J. Kinyanjui of the National Museum throughout our two month encampment, and from time to time of visitors who stayed for periods of a week to nearly a month.

THE ENVIRONMENT

The Tana River

The lowest part of the Tana River (the delta region below Ngao) is some 30-40 metres wide; further up, it averages 60 m and may reach 100 m in a few places. The river's depth in the dry season is only a few centimetres except for a narrow deep channel. Unlike many rivers, its breadth does not noticeably lessen in the dry season, but the river always occupies its whole bed which is dotted with sandbanks. The bed is raised and kept in place by a natural levee which is breached in places by natural floodwater channels. The height of the banks above the dry season water level is only 1 metre or so in the delta region, but up to 3 m in the Wema area (see Fig. 1).

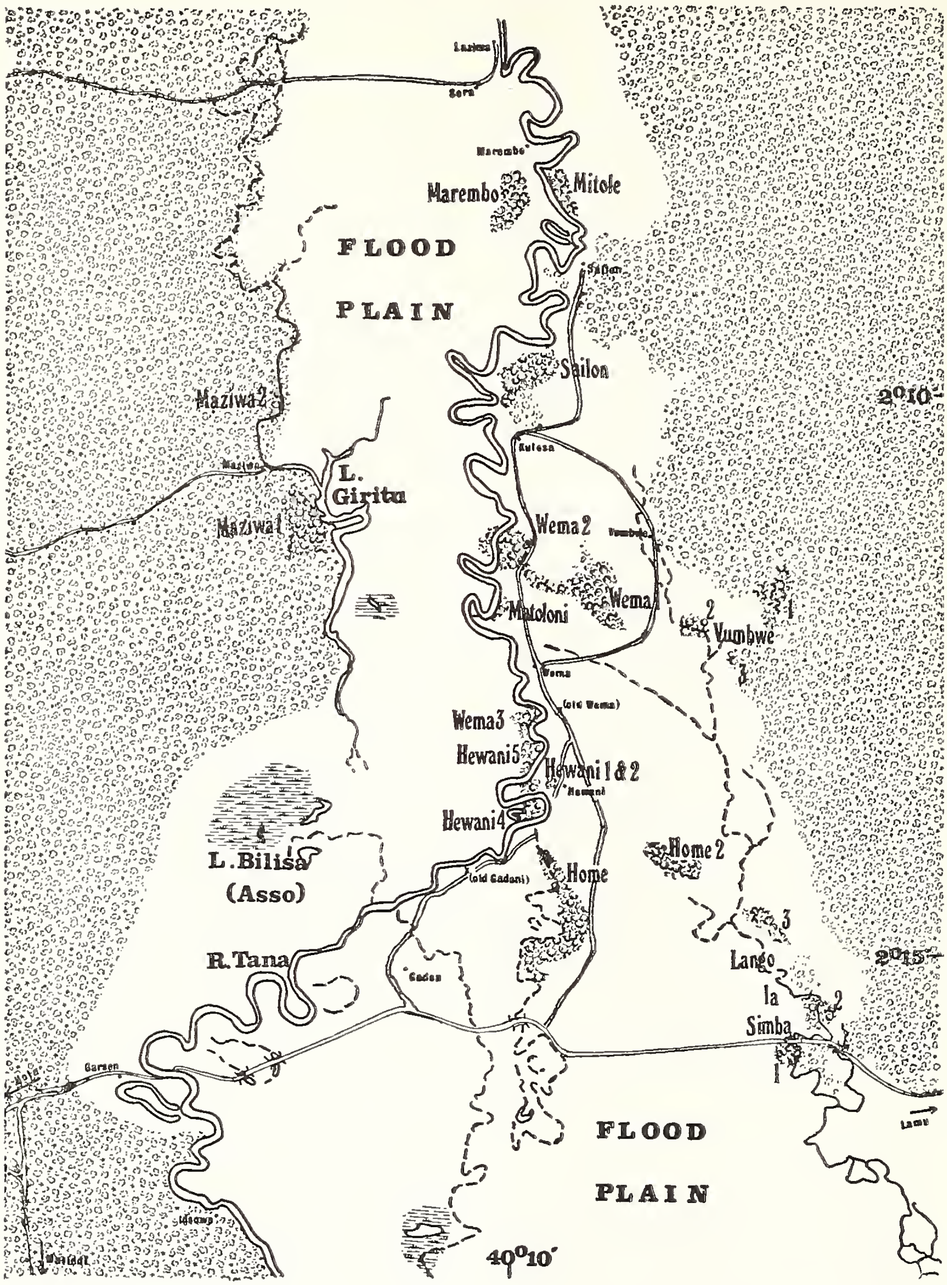

Fig. 2. The southern forests of the 1972 expedition, between Hewani and Mitole. The floodplain is shown in white and is bordered on both sides by bushland (hatched). Old river channels are shown by dashed lines.

The water speed averages 3-4 knots (5500-7400 m/hr), but in the narrowest part, below Wema, reaches 5 knots (9260 m/hr) (Denhardt and Denhardt, 1883). It should be noted that the river has found a new course below Wema since the Denhardts' day, but is still at its narrowest and swifted in this area. Upriver the flow is 2000 cu. sec., but since the lower river receives no tributaries its flow is halved by the time it reaches the sea (Prins, 1952).

In most years the river rises and overflows its banks, the floods remaining high for several weeks. These floods correspond to the rainy season inland, which fills up the upper course of the river, and are not significantly affected by the locay rains. In 1972, the year of our expedition, the river did not flood during the March-May rains but it did flood during the November-December rains. Water was then thigh-deep in Mnazini I, and the river was 8 km wide at Garsen. Twenty-three centimetres of mud, clay and sand were deposited throughout the forest (Katherine Homewood, pers. comm.).

Normal flooding covers the land several kilometres across, often breaking through the banks especially at the stronger bends, and forming broad discharge channels. Some of these follow lines of old river courses; others empty into permanent lakes, such as Lake Bilisa near Garsen and Lake Shakababo near Ngao (see Fig. 1). The floods inundate the gallery forests below Wenje, and kill most of the undergrowth; for this reason the understorey of nearly all the forests consists of saplings only, with little leaf litter and ground cover. The major exceptions to this are the Wenje forest itself and parts of the home forest near Hewani (see Figs. 2 and 3).

The Tana today flows into the sea at Kipini (see Fig. 1); this is not its natural mouth, but the mouth of a small creek, the Ozi. The Tana's own mouth was some 32 km down the coast, but in the 1860's the Sultan of Witu had a canal cut from Belazoni, on the Tana, to join with the Ozi, thus making the Tana itself navigable from Kipini. In 1895 the District Officer at Kipini had the canal widened as a famine relief project; shortly after this an unusually heavy flood carved a very wide channel and the Tana henceforth entered the sea via the Belazoni Canal and the Ozi. The original mouth at Mto Tana ceased to function except during floods when the whole area below Ngao takes on a delta appearance (Williams, 1962; Denhardt and Denhardt, 1884).

Higher up the river, between Garsen and Hola, the Tana has probably been restricted to the present flood plain for some time. There are a number of ox-bow lakes along the course; one such, at Garsen, was probably cut off in the 1961 floods (see Fig. 2). The flood plain is, however, dotted with old channels. Apart from the Ozi, there are four major old courses: one to the west of the present river, and three to the east (see Fig. 2).

The western channel is dry for most of the year except over a 5 km stretch on its southern part. This permanent water is known as Lake Giritu, although the people of Maziwa (the only village along it) are aware that it was at one time the Tana River. There are two forest patches along the "Lake", one of them large (see Fig. 2). On the eastern side of the river, a channel can be made out from Vumbwe as far south as Lango La Simba. A fragmented series of channels go south and east from Lango La Simba to join the Ozi at Kau (see Figs. 1 and 2). West of this channel is one which leaves the Tana just south of Hewani and runs a tortuous course south, beside and occasionally in and out of the expedition's Home Forest. The villagers of Hewani refer to it merely as "Dsanakai" (old river), but it was formerly called Ntumba ya Mudando (Mikael Samson, quoted in Darroch, 1943). South of the Malindi-Lamu road, this channel appears to merge into the third of the eastern channels, which leaves the Tana near Gadeni, and rejoins it somewhat above Ngao (see Figs. 1 and 2).

The question arises: how long has the Tana flowed in its present bed? On the available evidence it was in its present course in the 1870's (Samson, quoted in Darroch, 1943). Prior to that it would appear that the river flowed down the Ntumba ya Mudando channel beside the Home Forest some 150 years ago, and had done so for several hundred years. Earlier still, the Tana flowed past Lango La Simba into the Ozi at Kau. The

Giritu course presumably antedates even this, for there is no mention of it in Pokomo traditions.

Climate

The climate in general is hot and dry. The heat is mitigated during the middle six months of the year by the south-east monsoon which blows regularly almost every day. There are no permanent weather stations in the flood plain area, and the only sources of information are the readings taken by the Denhardts (Denhardt and Denhardt, 1884) and the stations at Malindi to the south, Lamu to the north, and Hola (Galole) inland. The Denharts recorded an air temperature for the area of 18-28°C, rising only 3-5°C in the "hot season", and falling by 10-15°C at night. These figures are somewhat lower than the very consistent recordings of the three weather stations, which range from 23-30°C at the coast and 22-34° at Hola; but given that the inland temperatures are more variable than the coastal, as well as slightly higher, there need be no major discrepancy.

Rainfall is concentrated in one main rainy season, in May and June. There is a minor rainy season at the end of the year, but this is not a constant feature near the coast. Rainfall is highest at the coast and drops off rapidly inland. The total rainfall at Hola is less than half that of the two coastal stations. The study area on the Tana River would, therefore, have rainfall less than that on the coast but more than that at Hola, approximately between 50 and 100 cm; but even the highest figures would not be sufficient to support the evergreen forest found there in the absence of other factors.

One of these factors, on which there are no quantitative data, might be the heavy dewfall. We found that at Bura the dewfall was negligible, but farther downstream, for instance at Baomo, Mnazini and Hewani, it was extremely heavy. Whether this is a correlate of the depth of the water table or of proximity with the sea is not known, but certainly some of the moisture might be expected to be retained in a forest by condensation and dripping from the leaves. As a regularly nightly feature, this could add considerably to the available water. Possibly linked with it is the degree of cloud cover which is less at the coast than inland.

Wind speeds at the coast are remarkably constant. At Malindi they range 4 to 6 knots in the morning, and from 5 to 7 knots in the afternoon. At Lamu they are higher and more variable, ranging up to 17 knots in the evening. These high wind speeds, combined with the lack of cloud cover allowing many hours of sunlight, would seem to make for high evaporation rates, far exceeding the rainfall. Under these circumstances it is hard to see how there could be any coastal forests at all unless they depend on ground water. This is undoubtedly the case with the Tana River forests, which are to be found only in the river flood plain.

Soil

The soils on the Tana River flood plain are in general heavy black clays ("black cotton soils"). When wet they swell up and quickly become impervious to water, so that they are poorly drained and become waterlogged. When dry they develop deep cracks. Even when the soil is apparently very dry, much water is retained in the capillary pores against the draw from the plant roots, so that the plants experience drought even when plenty of soil moisture remains. These clay soils are alkaline, with a *p*H of around 8, and show signs of salt accumulation with high sodium concentrations (2 to 3 per cent). Carbon and nitrogen proportions are low, particularly the latter, which by agricultural standards is greatly deficient. The vegetation is typically grassland or bushland.

In places the soil is noticeably more sandy and lighter in colour. The surface of the ground does not become cracked as it does with the black clays, and the soil is better drained. All of the six villages with which we were familiar in the Hewani area are built on this type of soil probably because of its better drainage. The soil is less saline than the

clays, although the sodium proportion is still high and the pH is only a little less. Nitrogen is abundant at the surface of the soil but deficient lower down. Rather surprisingly the carbon content of this soil apparently increases with depth to below 20 cm, but it is not known how far down this extends. The vegetation on this soil is bushed grassland, but it is probable that formerly it was some type of forest or woodland.

The soil in some woodland areas is a mixture of the two above types, with black clays near the surface and lighter coloured sands below 30-40 cm. There is some sodium accumulation; nitrogen and carbon percentages are low.

In forest habitats the soils are relatively more sandy, and are richer in nutrients and organic matter. There is a thin leaf litter and below it is a humus layer only 4-5 cm in thickness. These have low pH levels just over 7, low sodium percentages, relatively high potassium and calcium percentages, and high nitrogen and carbon levels. Below about 10 cm the organic content of the soil drops abruptly to less than one eighth of the value in the humus layer. Calcium and potassium levels drop by a half, but the sodium level increases by a factor of three to near toxic level. The soil stays like this to a depth of about 40 cm, and below this the sodium level starts to rise still further, reaching a value of 4 per cent at depth of 70 cm. At this depth the soil becomes darker in colour and has a higher clay content. It weathers like the black clay grassland soils, and mineralogically they are similar. It seems likely that the forest owes its existence, at least in part, to the sandy nature of the soil, by which drainage is improved, leaching promoted, and the accumulation of sodium salts to toxic levels prevented.

In view of the vegetation zonation of the Home Forest, a relative height profile was surveyed across the widest part of the forest, and soil pits were dug at various points along it so as to sample the soil under the different tree associations. It was found that there was an increase in elevation of 5.9 m over a distance of 460 m from the eastern edge of the forest to the highest point in the profile, which was 50 m from the western edge of the forest and 160 m from the old river channel bordering the forest to the west (see Fig. 3). It is possible that the forest is situated where it is because of the slight increase, raising it above the flood level when the Tana floods; but it is also possible that the increase has been brought about by the forest itself by deposition of organic matter.

The soil pits show a soil zonation that parallels that of the vegetation. To the east of the forest in the grasslands, the soil has a high clay content and has the appearance of a black cotton soil; the same is true of the soils in the bushland belt between the forest and grassland. Beyond the fringing bushland is a belt of *Mimusops* woodland which has black soils with high clay content in the top 30-40 cm of the profile, but below that the soil is much lighter in colour and has a high proportion of sand. In the main forest areas the soils vary from light brown to dark brown and have a high sand content. This sequence, although only tested along one line, suggests another explanation for the formation of forest in this area, namely that the increasing sandiness of the soil would be correlated with more luxuriant tree growth. In fact the nearby presence of the old river channel is indicative of both increased sandiness of the soil and improved local drainage (J. B. Gillett, pers. comm.) The profile measured across the forest shows the correlation between these factors (see Fig. 3).

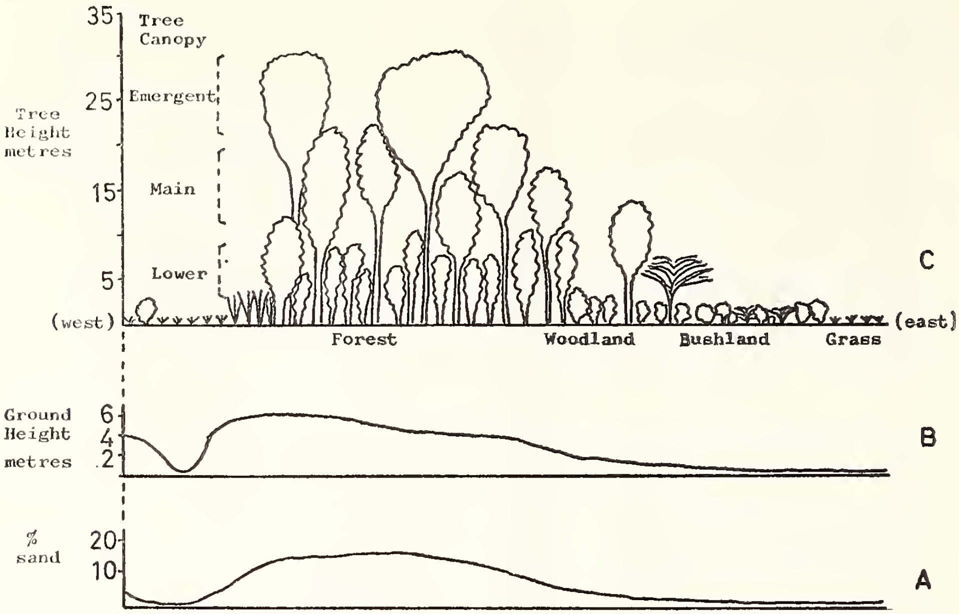

Fig. 3. Structure of the Home Forest: east-west profile showing; A. soil profile expressed in terms of percentage of sandiness of the soil, B. height profile of the surace of the ground, and C. vegetation profile.

TABLE I

Species lists of plants found along the Tana River

Grassland	*Bothriochloa glabra* (Roxb.) A. Camus
	Echinochloa haploclada (Stapf) Stapf
	Setaria splendida Stapf
	Panicum maximum Jacq.
	Sporobolus confinis (Steud.) Chiov.
	Digitaria adscendens (H.B.K.) Henr.
Bushland and bushed grassland	
Shrubs	*Thespesia danis Oliv.*
	Lamprothamnus zanquebaricus Hiern
	Carissa edulis (Forsk.) Vahl
	Allophylus sp.
	Acacia zanzibarica (S. Moore) Taub.
	Terminalia sp.
	Rhus natalensis Krauss
Trees	*Acacia stuhlmannii* Taub.
	Acacia robusta Burch.=*A. clavigera* E. Mey.
	Tamarindus indica L.
	Terminalia spinosa Engl.
Palms	*Borassus aethiopum* Mart.
	Hyphaene coriacea Gaertn.
Woodland type A	
Trees	*Acacia robusta* subsp. *usambarensis* Burch.
	Mimusops fruticosa A. DC.
	Diospyros mespiliformis A. DC.
	Ficus sycomorus L.
	Garcinia livingstonei T. Anders.

	Sorindeia madagascariensis DC.
	Cola clavata Mast.
Shrubs	*Rinorea ilicifolia* (Oliv.) O. Ktze.

Woodland type B

Trees	*Cynometra* 2 species
	Garcinia livingstonei T. Anders.
	Diospyros abyssinica (Hiern) F. White
	Mimusops fruticosa A. DC.
	Strychnos sp.
	Haplocoelum foliolosum (Hiern) Bullock
	Lannea stuhlmannii (Engl.) Engl.
Shrubs	*Diospyros natalensis* (Harv.) Brenan
	Thespesia danis Oliv.
	Eugenia sp.
	Maytenus sp.
	Bridelia micrantha (Hochst.) Baill.

Lowland evergreen forest—natural forest

Trees	*Sorindeia madagascariensis* DC.
	Celtis wightii Planch.
	Diospyros mespiliformis A. DC.
	Diospyros abyssinica (Hiern) F. White
	Cordia goetzei Guerke
	Pachystela brevipes (Bak.) Engl.
	Gyrocarpus americanus Jacq. subsp. *americanus*
	Garcinia livingstonei T. Anders.
	Cola clavata Mast.
	Oxystigma msoo Harms
	Sterculia appendiculata K. Sch.
	Ficus sp.
Shrubs	*Polysphaeria parvifolia* Hiern
	Harrisonia abyssinica Oliv.
	Rinorea ilicifolia (Oliv.) O. Ktze.
	Diospyros natalensis (Harv.) Brenan
	Rubiaceae
Lianes	*Pterolobium stellatum* (Forsk.) Brenan
	Paullinia pinnata L.
	Harrisonia abyssinica Oliv.
Palms	*Borassus aethiopum* Mart.
	Hyphaene coriacea Gaertn.
	Phoenix reclinata Jacq.

Lowland evergreen forest—cultivation forest

	Mangifera indica L.
	Ficus sycomorus L.
	Trichilia roka (Forsk.) Chiov.
	Bridelia micrantha (Hochst.) Baill.
	Diospyros natalensis (Harv.) Brenan
	Harrisonia abyssinica Oliv.
	Polysphaeria parvifolia Hiern.
	Phoenix reclinata Jacq.
	Alangium salviifolium (L. f.) Wangerin subsp. *salviifolium*

Vegetation

Most of the flood plain is covered with grass. There are, however, extensive areas of bushland, rather less woodland, and a few patches of forest. These types will each be described in turn.

Grassland

On parts of the flood plain grassland may be a naturally occurring edaphic vegetation type. Seasonal flooding and poorly drained soils are important factors, and where they

occur it is unlikely that grassland has replaced any other vegetation type. On the other hand it can be seen that ecological disturbance, especially the annual burning carried out by the Orma pastoralists, causes grass to encroach on woodland and bushland, and much of the flood plain may at one time have been covered by bushland.

There were at least three types of grassland recognised on the Tana flood plain. The most widespread type on the heavy black clays is dominated by *Echinochloa haplo-clada*, which occurs together with *Setaria splendida*, *Bothriochloa glabra* and several other less common species. These are species widely spread in tropical Africa in areas liable to flooding. This grassland type was divided into sharply delineated regions; in some regions the grass was still green at the height of the dry season, and in other regions it was brown and dried up, even though the same species were present in both. Presumably the difference was due to variations in groundwater level or soil distribution.

In places where the surface soils were noticeably more sandy, the grass species were found to be quite different. Two divisions of this type were recognised, dominated respectively by *Digitaria adscendens* and *Sporobolus confinis*. It is likely that flooding is less severe in such areas, as neither of these species grow in very wet places.

The third type of grassland is the tall grass community bordering many patches of forest. Only one species is common here, *Panicum maximum*, and it grows very tall, over 2 m in places. This grass was also still green in the dry season, and when the short grass areas were being burnt near the Home Forest the *Panicum* grassland acted as a buffer preventing the spreading of fire into the forest.

In places, but not further inland than the latitude of Kulesa, the grassland was dotted with palms, especially *Hyphaene coriacea* (doum palm) and *Borassus aethiopum* (borassus palm). In places, both these grew within the forest; and towards the coast they formed forest-like associations by themselves (as around Ngao and Kipini).

Wooded grassland

From about Hola to Wenje is a distinctive habitat, with good growth of grass (even in July) and the trees *Dobera loranthifolia* and *Albizia anthelmintica* spaced through it. It is interspersed with bushland and abruptly distinguished from it. There was a noticeable increase here in plains game, especially Peters' gazelle *Gazella granti petersi* Gunther.

Bushland

Thick evergreen bushland occurs on the flood plain in two kinds of situations, and with different species composition. The most common one has the same species as, and often grades into, bushed grassland (see Table 1), the difference being one of density. The trees and shrubs of bushland form a low and impenetrable canopy, and there is little or no herbaceous vegetation. Those of the bushed grassland are more scattered or are in clumps, and there is an extensive ground cover of grass. There are a number of larger trees of *Acacia robusta* and *Tamarindus indica* in the bushland, and they are protected from fire there, but there is no place where these trees become dense enough for a definite bushland-woodland succession to be established. It is probable that the bushland is a naturally occurring flood plain type and that climatic or edaphic changes would be necessary for it to convert to woodland or forest. Grass fires are encroaching on the bushland, converting it to bushed grassland and eventually to pure grassland.

The other kind of bushland is a forest-derived association, following the destruction of forest by cultivation. The species present are the same as those found in the shrub layer of the forest community (see Table 1). Two variations occur, one in which the dominant element is *Phoenix reclinata*, and the other in which members of the family Rubiaceae dominate, together with *Rinorea* species and *Harrisonia abyssinica*.

Away from the flood plain, bordering it on either side along the lower course of the Tana and almost reaching the river itself higher up (above Mnazini), grows *Acacia/*

Commiphora bushland. The distribution of this type of bushland extends far into the arid country on either side. Where it is intersected by flood plains it supports growths of stunted *Suaeda monoica* and *Salvadora persica*. Towards the river the *S. persica* becomes thick and in parts dense, and there are also fairly dense stands of the euphorb *Spirostachys africana*.

Deciduous woodland

Two distinct associations of woodland are present. In physical structure they are similar, having single open canopies and a sparse shrub layer, but the species compositions are distinctive. The most common association (Type A) is characterised by *Acacia robusta* subsp. *usambarensis*, and *Mimusops fruticosa*. The former is particularly common and forms nearly pure stands in places. In this it resembles the more common Kenya woodland species *A. xanthophloea*, but the canopy in the latter is thicker and there is usually a denser shrub and herb layer. In the other, more localised form of woodland (Type B) there is no *Acacia* and only occasional *Mimusops;* it is characterised by an abundance of *Cynometra* species and *Garcinia livingstonei* (see Table 1).

Lowland evergreen forest

In the flood plain region, there are very few areas where true forest can be said to occur. Where it does, it is fragmented rather than continuous. In the flood plain forests there is a fairly continuous main tree canopy in which *Sorindeia madagascariensis* and *Diospyros* species are the most common trees. There is also a continuous lower canopy consisting largely of *Cola clavata* and *Garcinia livingstonei*. In places there is an emergent canopy, but the trees are widely scattered and completely absent in places. The most notable of the emergents, all of which are extremely large, are *Sterculia appendiculata*, *Oxystigma msoo*, and an unidentified *Ficus* species (see Table 1).

The most representative flood plain forest in terms of number of species is the Home Forest near our camp site at Hewani which has nearly all the species listed in Table 1. There are two variations in species composition. One of these is the forest at Maziwa (on the old course of the river, to the west of the present Tana). This is almost entirely dominated by *Garcinia livingstonei*, both middle and lower canopies, and there is a discontinuous emergent canopy of *Sterculia*, *Ficus*, and *Celtis wightii;* the shrub layer is almost non-existent and what there is of it is composed mostly of *Rinorea ilicifolia*. The other variation is Mnazini III, on the east side of the river. This also is dominated by a single species, in this case *Pachystela brevipes*, which together with *Sorindeia* and *Gyrocarpus americana* make up the single main canopy. The lower canopy and shrub layers are similar to those of the Home Forest.

The presence of an appreciable shrub layer seems to be linked with the degree of flooding experienced by the forest concerned. In a forest subjected to regular annual flooding the shrub layer, except for the taller saplings, is drowned, and visibility in such forests tends to be good, of the order of 20 metres or more. Such forests on the other hand have a thin even carpet of leaf litter. Forests not undergoing annual floods have much more undergrowth, severely restricting visibility as well as movement. The Home Forest is more diverse than most others in that parts of it are raised slightly and so not usually flooded, whereas other portions which do flood are clear of undergrowth.

Elephants, too, have a very evident effect on the structure of the forests. Wema II is in part almost totally opened up, with plenty of evidence of constant visitation by elephants.

Evidence that the flood plain forests were at one time more extensive is provided by areas of forest regrowth. This forest that is regenerating after clearing for agriculture is referred to here as cultivation forest, and it is dominated by mangoes and figs with *Trichilia roka* forming the lower storey. The shrubs are the same as those found in natural forest. It seems very likely that when cultivation of a former forest area is finished,

there is a succession back to semi-natural forest through the bushland and cultivation forest stages. The situation is complicated by the mango; this is an introduced tree, and its prevalence in the cultivation forest is probably the result of its being planted when the area was inhabited. Its absence from any of the natural forests seen probably indicates that these forests were already in existence when the mango was introduced to the Kenya coast.

Floral affinities

Many of the trees in the Tana River forests and woodland are those typical generally of riverine and groundwater vegetation in Kenya and Tanzania. A number of these appear to be almost unique to the region and have doubtful affinities with other parts of Africa, notably *Oxystigma msoo* and *Populus ilicifolia*. The latter occurs in the thin forest-like strip on the very edge of the river in the middle course (Bura to above Garissa), but is not a constituent of forests or woodlands on the flood plain, growing singly or in small groups near the river's edge. It occurs only along permanent rivers in the eastern watershed of Kenya: the Tana, Athi and Ewaso Ngiro rivers; and its closest relative today is *P. euphratica* Oliv., a riverine species of the Euphrates (J. B. Gillett, pers. comm.). *Oxystigma* is a genus with predominantly Central and West African species, but *O. msoo* is known from only three localities in eastern Kenya and Tanzania (Brenan, 1967, p. 134). The two common species in the Tana River woodlands both have a mainly eastern distribution. *Acacia robusta* is widely distributed in East Africa, but *Mimusops fruticosa* is restricted to the east coast (Brenan, 1959; p. 118; Hemsley, 1968, p. 53). Others of the riverine species, on the contrary, have a pan-African or even wider distribution, and these also do not indicate any specific affinities of the flora: examples are *Celtis wightii* (Africa to Australia, Polhill, 1966, p. 9), *Gyrocarpus americanus* (Kubitzky, 1969, p. 182) and *Alangium salvifolium* (East Coast of Africa, and Asia, Verdcourt, 1958, p. 2). A few of the Tana forests species occur also in West Africa, but none of the common West African species are present in the Tana forests, although some occur in other East Coast forests. *Garcinia livingstonei*, *Diospyros mespiliformis*, and *Pachystela brevipes* are all riverine species in the Uganda and East Zaire forests present also in the Tana River forests, but they are all widely distributed and not necessarily confined to lowland forests (Hemsley, 1968). More common forest species such as *Sorindeia madagascariensis*, *Cola clavata*, *Cordia goetzei* and *Sterculia appendiculata* are entirely eastern in distribution.

The total number of tree species present in the Tana forests is very small. Of the three examples of flood plain forests given earlier, the Home Forest is largely dominated by *Sorindeia madagascariensis*, the Maziwa forest by *Garcinia livingstonei*, and Mnazini III by *Pachystela brevipes*. Such single species dominance and the small overall number of tree species indicates that the Tana River forests are extremely impoverished. When the distributions of the individual tree species outlined in the preceding paragraph are considered as well, it would appear that the impoverishment has most affected the West African species, species that are common in other eastern coastal forests. We may conclude that either the West African forms were present at one time but have since died out, or else that they never reached the Tana. This latter possibility implies that the eastern coastal forests were populated by floral dispersal via a southern route, and indeed such a route still exists in fragmented form (Kingdon, 1971). In any case, it can be said that the Tana River forests as they exist today are less like their West African counterparts than most other coastal forests, a conclusion not completely consistent with the faunal evidence (see later sections).

The human population

Three main tribal groups live along the middle and lower Tana: Pokomo, Orma and Somali. Two small tribes, the Boni and Sanye, formerly hunter-gatherers, are said to live in the vicinity but they were not encountered by us. The Pokomo, a Bantu-

speaking tribe, are the riverine people *par excellence*. They live by cultivation of rice, maize, bananas and a few other crops, and possess goats, chickens and dogs. The Orma, a branch of the Galla, live intermingled among the southern Pokomo subtribes. The Orma do not cultivate but own large herds of cattle, white and long-horned. They are less nomadic than formerly. The Somali often move into the riverain zone from the desert area, especially on the north bank of the river. Many are still nomadic; others are settled in the villages of other tribes, such as in the Orma village of Gadeni.

We have attempted to assess the likely conservation prospects of the area by investigating trends in human population levels. The presence of numerous cultivation forests along the river demonstrates that forest areas have been partially destroyed for cultivation in times past, and indicates that this might occur again. At Wenje maize plantations are already encroaching deep into the forest, while both at Maziwa and at Mnazini they have expanded almost up to the forest edge. Although the local irrigation schemes now being undertaken at Hewani and Wema will doubtless result in increased agricultural yield per hectare, in the long run crop increases must inevitably depend on expansion of cultivated area with its consequent removal of natural wildlife habitat.

The census data for the Tana River region were examined in the Kenya National Archives, by courtesy of the Ministry of Natural Resources. Three sets of figures are available: 1948, 1959 and 1962; but, with few exceptions, the figures for 1959 are higher than those for 1962, a situation which might be attributed to social disruption after the 1961-2 floods. Since most of the 1962 figures were double-checked and serious inconsistencies were found only for Gwano location, it is these rather than the 1959 figures which will be accepted here. By taking the 1948 figures as a comparison (there is no means of checking these, so they have to be taken at face value) the parameters given in Table 2 are arrived at.

TABLE 2

Population estimates of the Wapokomo of the Tana flood plain region

Location	Total population 1948 census	Total population 1962 census	Annual increase per cent	Percentage of children 1948	Percentage of children 1962
Kinakomba	1,754	2,644	3.0	44.2	59.3
Gwano	469	698	2.9	46.5	(51.4)
Ndera	1,613	2,075	1.8	42.8	40.3
Salama	1,656	2,497	3.0	42.3	43.6
4 locations	5,492	7,914	2.7	43.4	49.2
3 lower locations	3,738	5,270	2.6	43.2	44.2

It will be seen that, whatever the degree of accuracy involved, the population has undoubtedly increased. The annual rate of increase on the figures given was 2.7 per cent p.a. over 14 years for four locations covering much of the lower flood plain, an increase which compares closely with the current increase rate of 3 per cent p.a. for Kenya's Coast Province, and is also consistent with the percentage of "children" (under 14s?) in the 1948 sample, forming 43.2 per cent of the total. If the figures are to be trusted, the lower dependency load has increased since 1948, and the rate of natural increase should be accelerating. The implications of this for conservation are grave. This is especially ironic in view of the tolerance of the Pokomo themselves towards wild animals, and the appreciation of them which some of them express.

Forests of the study area

The forests and woodlands of the Lower Tana are enumerated in Table 3. The forest types have already been described, but the distribution of the types is of interest.

All of the patches of cultivation forest are along the edge of the present course of the river. There are some areas away from the river where forest has evidently been cleared in the last 100 years and cultivation practised, for instance between Hewani and Wema, but forest is not regenerating in these areas. The inference is that forest only regenerates near the river; away from the river a forest environment may be self-perpetuating but if it is cleared by man it is unable to regenerate.

TABLE 3

Forests and woodlands of the Lower Tana flood plain

Name of forest/woodland	Area (ha)	Type	Presence of: Mangabey	Colobus
Lango La Simba I	1	*Cynometra* woodland	formerly	x
II	2	,, ,,		
III	2	,, ,,		
Home Forest	50	Lowland evergreen forest with single-dominant and woodland zones	x	xx
Home II	5	*Cynometra* woodland		
Hewani I	1	Cultivation forest	x	x
II	1	,, ,,	x	x
III	1	,, ,, (still cultivated)		
IV	1	,, ,,	x	x
V	2	,, ,,	x	x
Wema I	—	*Cynometra* woodland		
II	—	,, ,,		
III	2	Cultivation forest	x	x
Matoloni	1	,, ,,	x	
Sailon	—	Lowland evergreen forest (v. damaged)		
Mitole	5	Cultivation forest	x	x
Ngumu I	2	*Acacia* woodland	x	x
Berlin	5?	,, ,,	x	
Maziwa I	40	Lowland evergreen forest (*Garcinia*)	xx	
II	1?	,, ,,	x	
Mnazini I	30	Lowland evergreen forest with *Acacia* woodland zones	xx	xx
II	15	Cultivation forest	x	x
III	50?	Lowland evergreen forest (*Pachystela*)	x	x
Baomo	—	*Acacia* woodland	x	x
Kimbu	150?	Lowland evergreen forest (*Sorindeia*)	xx	x
Wenje	30	,, ,, with cultivation forest patches	x	

Notes. The list is based on visits and brief surveys to the forests concerned in each case, with the exception of Maziwa II which is included on the basis of statements by local informants.

Under 'Presence of colobus and mangabey', x indicates that the species still occurs there, xx indicates that it is to be found in comparatively large numbers.

The following forests/woodlands have not been seen, and are not listed: Ngumu II, Munyuni, Bubesa, Kinyado, Nguvini, Kipende, Makere ya Gwano. Judging from map outlines, the total area of these would be of the order of 185 ha. Both colobus and mangabey are reputed to occur in most of them.

Two forest areas that are surviving away from the present course of the river are the Home and Maziwa I Forests. The former is on an old river course that was cut off at least 150 years ago; and the latter is on Lake Girita, an even more ancient part of the river course that still has permanent water in the form of a lake. Both these forests show signs of decline. At Maziwa the main forest canopy is regular but it is composed almost exclusively of one species, *Garcinia livingstonei*. There are a few emergent trees remaining, but no prospective emergents were seen in the lower canopies. Parts of the

Home Forest have reached this stage. It is probable that deficiencies in the environment (most importantly lack of water and correlated rise in alkalinity in the soil) are initially translated into decreasing variety of forest species and finally, under extreme conditions, result in complete destruction of the forest.

There was no evidence seen for the new formation of forest patches, but this lack is probably the result of fire. Much of the flood plain is regularly burnt every year, and this destroys the bushland which would be successional to woodland and forest. Some of the woodland areas along the river are almost certainly a late part of such a succession leading to forest; a good example of this is seen in the Mnazini II Forest which is partly *Acacia* woodland, partly *Acacia* mixed with forest trees, and partly closed forest. It can reasonably be inferred that were it not for fire new patches of forest would be in the process of formation along the present river banks.

It would appear from this evidence that the forests of the flood plains are in a state of flux. Away from the river they are dying off, but along the present channel they are regenerating or would be in the process of being formed were it not for the regular burning. Viewed from the perspective of hundreds of years, the pattern emerges of a river continually changing its course, with forest patches that emerge and die off in comparatively short periods of time as the river alters its course. Such a changing environment would put great pressure on the fauna living in it.

DISTRIBUTION OF FAUNA

A total of 47 species of mammal and 230 species of bird were seen in the course of the field season. Many of the contacts were casual sightings, and no attempt could be made to assess the degree of importance in the flood plain ecology.

TABLE 4

Birds of the Lower Tana River

Sequence and taxonomy follow Forbes-Watson (1971). Subspecific names are omitted except when identification was certain. Assignation to a particular habitat of aerial birds such as swallows and swifts is arbitrary. Species marked with an asterisk are widespread in East and Equatorial African forests. Species marked with a double asterisk are usually restricted to Central African lowland forest. n = netted.

Habitats 1 = *Acacia/Commiphora* scrub
2 = *Dobera/Albizia* parkland
3 = River banks
4 = Riverine forest
5 = Perennial grassland savanna

	1	2	3	4	5
Struthio camelus					+
Pelecanus rufescens			+		
Anhinga rufa			+		
Ardeola ralloides			+		
A. ibis			+		+
Egretta intermedia			+		
E. alba			+		
E. garzetta			+		
Ardea melanocephala			+		
A. goliath			+		
Scopus umbretta			+		+
Ciconia episcopus					
Ephippiorhynchus senegalensis					+
Ibis ibis			+		
Leptoptilus crumeniferus					+
Threskiornis aethiopicus					+
Bostrychia hagedash			+	+	+
Alopochen aegyptiaca			+		
Sarkidiornis melanota			+		
Dendrocygna viduata			+		
Gyps rueppellii	+				
G. fricanus	+			+	+

	1	2	3	4	5	
Neophron monachus	+				+	
Gypohierax angolensis					+	
Circaetus pectoralis		+				
C. cinereus		+				
***C. fasciolatus*				+		
Terathopius ecaudatus	+	+	+		+	
**Accipiter tachiro*				+		
Melierax poliopterus	+	+				
M. gabar	+	+				
Kaupifalco monogrammicus				+	+	
Lophaetus occipitalis		+			+	
**Stephanoaetus coronatus*				+		
Hieraaetus dubius					+	
**Aquila wahlbergi*				+	+	
Haliaaetus vocifer			+		+	
Elanus caeruleus					+	
**Macheiramphus alcinus*				+		
Falco cuvieri					+	
F. chicquera					+	
Sagittarius serpentarius		+			+	
Francolinus sephaena	+	+			+	
F. afer					+	
F. leucoscepus			+			
**Guttera pucherani*				+		
Acryllium vulturinum			+			
Otis kori		+				
Eupodotis ruficrista	+					
E. senegalensis		+				
Actophilornis africana			+			
Vanellus spinosus			+			
V. tectus	+	+				
V. lugubris		+				
Charadrius pecuarius			+			
Burhinus capensis					+	
B. vermiculatus			+			
Pterocles decoratus	+	+				
P. lichtensteinii	+					
Streptopelia decipiens		+	+		+	
S. semitorquata					+	
S. capicola			+		+	
S. senegalensis			+		+	
Oena capensis		+	+			
**Turtur tympanistria*				+		
T. chalcospilos			+			
**Treron australis*				+		
Poicephalus rufiventris		+	+			
Tauraco fischeri			+			
Corythaixoides leucogaster		+				
Pachycoccyx audeberti					+	
Centropus grillii					+	
C. superciliosus					+	
Otus scops		+	+			
Glaucidium perlatum		+	+			
**Ciccaba woodfordii*				+		n
**Caprimulgus pectoralis*				+	+	
C. donaldsoni					+	
C. clarus					+	
Apus aequatorialis						
Cypsiurus parvus						
Telacanthura ussheri						
Colius striatus					+	
C. leucocephalus			+			
C. macrourus		+	+			
**Apaloderma narina*				+		n
Ceryle rudis			+			
Alcedo cristata			+			
**Ceyx picta*				+		n

	1	2	3	4	5	
Halcyon senegaloides			+			
H. chelicuti		+			+	
**H. albiventris*				+		
H. leucocephala					+	
Merops albicollis		+				
M. pusillus			+			
M. revoilii	+					
M. s. superciliosus				+		
Coracias caudata lorti	+				+	
**Eurystomus glaucurus*				+		
Upupa epops africana	+	+				
**Phoeniculus purpureus*				+		
**P. granti*				+		
P. minor		+				
P. cyanomelas		+				
Tockus nasutus		+				
T. erythrorhynchus	+	+				
T. deckeni	+	+				
T. flavirostris		+		+		
**T. alboterminatus*				+		
**Bycanistes bucinator*				+		
**Lybius melanopterus*				+	+	
**L. torquatus*				+	+	
L. melanocephalus		+				
Pogoniulus pusillus	+	+				
Trachyphonus darnaudii	+	+				
T. erythrocephalus	+	+				
**Indicator variegatus*				+		n
**I. indicator*				+		
**I. minor*				+		n
**Campethera nubica*		+		+		
**C. abingoni*				+		
**C. cailliautii*				+		
Dendropicos fuscescens		+				
Thripias namaquus		+				
Mirafra rufocinnamomea					+	
M. poecilosterna					+	
Eremopteryx leucopareia					+	
Hirundo smithii						
H. senegalensis						
H. abyssinicus						
Motacilla aguimp			+			
Anthus novaeseelandiae					+	
A. melindae					+	n
Tmetothylacus tenellus		+				
Macronyx croceus		+				
M. aurantiigula		+				
**Campephaga flava*				+		
Pycnonotus barbatus		+		+		
Andropadus importunus					+	
Chlorocichla flaviventris				+	+	n
Phyllastrephus strepitans					+	
P. terrestris					+	
**P. fischeri*				+		n
Eurocephalus rueppellii	+	+				
Prionops plumata		+				
P. retzii					+	
**Nilaus afer*	+	+				
Dryoscopus pringlii				+		
**D. cubla*				+		
Tchagra senegala					+	
Rhodophoneus cruentus	+	+				
Laniarius ferrugineus		+			+	
Malaconotus sulfureopectus		+				
M. blanchoti		+				
Lanius cabanisi		+				
L. dorsalis	+	+				

	1	2	3	4	5	
Cercotrichas leucophrys		+				
*C. quadrivirgata				+		
**Sheppardia gunningi				+		n
*Cossypha natalensis				+		n
*C. heuglini				+		n
**Neocossyphus rufus				+		n
Cichladusa guttata			+			
C. arquata					+	
Turdoides squamulatus					+	
T. rubiginosus			+		+	
*Bradypterus baboecala				+		n
Cisticola chiniana					+	
C. galactotes					+	
C. brachyptera					+	
Prinia subflava					+	
Apalis flavida		+	+			
*A. melanocephala				+		n
Camaroptera brevicaudata			+	+	+	n
C. simplex			+			
Sylvietta brachyura			+			
*Muscicapa caerulescens				+		n
Melaenornis pammelaina			+			
Bradornis microrhynchus		+	+			
Batis minor			+			
*Platysteira peltata				+		n
**Erythrocercus holochlorus				+		
*Trochocercus cyanomelas				+		n
*Terpsiphone viridis				+		n
*Nectarinia olivacea				+		n
N. amethystina		+			+	
N. hunteri	+	+				
N. mariquensis		+			+	
N. veroxii					+	
N. nectarinioides	+	+				
N. senegalensis		+			+	
**Anthreptes reichenowi				+		
A. orientalis		+				
*A. collaris				+		n
*Zosterops sp.				+		
Serinus mozambicus					+	
S. atrogularis					+	
Pytelia melba		+				
Estrilda astrild			+		+	
Uraeginthus bengalus					+	
Lagonosticta rhodopareia					+	
Lonchura bicolor					+	
L. cucullata					+	
Ploceus subaureus					+	
P. bojeri					+	
P. castaneiceps					+	
P. cucullatus					+	
*P. bicolor				+		n
*P. ocularis				+		
P. rubiginosus		+				
P. velatus		+				
Quelea quelea		+			+	
Euplectes ardens						
E. axillaris					+	
Bubalornis niger		+				
Dinemellia dinemelli		+				
Passer gongonensis		+				
Petronia pyrgita		+				
Vidua macroura					+	
*Lamprotornis corruscus				+		
L. purpuropterus		+			+	
*Cinnyricinclus leucogaster				+		
Spreo fischeri		+				

	1	2	3	4	5	
S. superbus		+				
Cosmopsarus regius	+	+				
Creatophora cinerea		+				
Buphagus erythrorhynchus	+	+				
**Oriolus larvatus*				+		
**Dicrurus ludwigii*				+		n
D. adsimilis	+	+				

Birds

The list of birds in Table 4 is based on both observation and mist-netting. The 230 species detected would doubtless be considerably enlarged by studies continued throughout the year. In Table 4 the recorded observations are divided up into five habitat types. Many of the species observed were recorded from only one habitat type because of the differences between these habitats.

In the forest it appeared that lack of undergrowth had a marked effect on the abundance of bird species. No tinker-birds (*Pogoniulus* spp.) were seen or heard by J.F.M.H. or by A. Forbes-Watson, although they were evident in the Sokoke Forest, near Malindi in the same period. Only four undergrowth species were netted in the Home Forest (*Bradypterus*, *Phyllastrephus*, and two *Cossypha* spp.), although protracted study would doubtless reveal more. This forest was however remarkable for abundance of the drongo *Dicrurus ludwigii* and the thrush *Neocossyphus rufus*. The forest at Wenje was visited on one day only and yet was found to have a richer avifauna than forests near base camp. There were many mixed species foraging flocks there, such as were seldom observed in the Home Forest. Stands of tall *Ficus* spp. and considerably more undergrowth could account for this.

In the flood plain grasslands, the palm clusters form a distinctive habitat for birds. A belt of *Hyphaena coriacea* and *Borassus aethiopum* at the south end of the Home Forest (a locality known as Mitapani, "the place of the palm-trees") held nesting vultures *Gyps africanus* and falcons *Falco chicquera*.

A few of the bird records are range extensions. *Bradypterus baboecala* subsp. was netted in the Home Forest on 16 and 17 July. It is the first record for the region, and the habitat is unusual for the species. One was collected and the skin is in the National Museum, Nairobi. A male and female of the sunbird *Anthreptes reichenowi* were observed in the Home Forest on 27 August. This represents a range extension of about 160 km northward from the Sokoke Forest, its nearest previously known habitat. Two specimens of the small insectivorus kingfisher *Ceyx picta* were netted in the Home Forest on 15 and 17 July, and, having the blue ear-covert spot, were assigned to the southern African race *natalensis* rather than the northern tropical *C.p. picta*. White (1965) gives the southern limit of *picta* as the Kenya/Tanzania border and the northern limit of *natalensis* as central Tanzania, but more recently Ripley and Bond (1971) recorded the latter in the Sokoke Forest.

Primates

Five species of monkey and two of prosimian were recorded in the Tana River forests and woodlands. In some forests all seven were recorded, but usually one or two appeared to be absent or were not seen.

Colobus badius rufomitratus Peters Tana River Red Colobus

Red colobus are found mainly near the river from Hewani north to Kipende. Away from the present river course they occur only in the Home Forest, where there is a large healthy population, and at Lango La Simba where in February 1972 one of us encountered a considerable group.

The types of forest inhabited by red colobus may be differentiated into large, containing more than one troop, and small, containing most probably a single troop

only. Two factors appeared crucial in determining the presence or absence of colobus in a given forest. The first of these was variety of food species. In the marginal forests to the east of the river (Home II, Lango La Simba II and III, Vumbwe group) the variety of tree species is much reduced; indeed, some of them are virtually pure stands of *Garcinia livingstonei*, and colobus were never seen in these forests. Colobus are also apparently absent from Wema I which is dominated in part by *Cynometra* which elsewhere is eaten by colobus; the main reason for their absence here, and also from Wema II seems to be the dry scrubby nature of the forest which stands, according to J. B. Gillett, on soda-logged soil.

The second factor, which seems to exclude colobus from forests that might have been suitable for them in terms of food, was canopy structure. During certain periods of the day colobus would be found sitting in open, thinly foliaged emergent crowns. Apart from pure sunning, it may be that such rest periods are essential for the animals' digestive processes (Hollihn, 1971). In any case, forests with a closed, continuous canopy and few open emergents—such as the Maziwa forests, Sailon and Wenje—lacked colobus.

Red colobus are easy to observe, their presence being simple to detect (either they sit in the very tops of the trees and watch the observer, or they jump away with a characteristic crashing sound), and one is liable to gain an initial false impression of their abundance. In point of fact it seems likely that mangabeys, though much harder to detect, are at least as numerous as the colobus. Where we were able to obtain fairly accurate estimates or even actual counts of colobus numbers, it appeared that their population density was greater in the small isolated forests than in the larger forests. We can hypothesize that in the small forests food supply would be the only limiting factor, whereas in larger forests the presence of several troops, with the consequent restriction on the use of space, would represent an additional control. Average densities were, for large forests, 2.8 individuals per hectare, and for small forests, 5.75 per hectare. It should be noted, however, that the large forests are by no means homogeneous, and it may be that the lower density is the direct result of this, since only parts of the forest will be habitable. In contrast to this the more homogeneous small forest patches are more completely utilized by the colobus (C. Marsh, pers. comm.). We have therefore divided up the forests known or suspected to be inhabited by colobus, into two groups according to their size (Table 3). The small forests for which we have extrapolated densities and numbers account between them for only 58 colobus—a small fraction of the total. On the other hand, the Mnazini group of forests, for which we have reliable estimates, and the rest of the northern group, consisting of 430 ha, we estimate carry about 1210 colobus, nearly two-thirds of the total, which is probably about 1860.

Cercocebus galeritus galeritus Peters Tana River Mangabey

In view of the supposed greater rarity of the mangabey, and the fact that it is awarded a red sheet in the *Red Data Book*, the colobus taking a white sheet only, we were surprised to find that its distribution is wider than that of the colobus. Mangabeys occur in a number of forests not inhabited by colobus. Apart from a number of small forests along the lower part of the animals' distribution along the river, the main such forests are Maziwa and Wenje. Both of these are large, closed-canopy forests; the tall open emergents favoured by red colobus are uncommon, and there are few open areas. The internal structure of the two is, however, different: Maziwa has little tangled undergrowth, but plentiful leaf-litter and numerous saplings, so that visibility within the forest is good, about 20 to 30 yards; Wenje is full of tangled undergrowth, implying much secondary regeneration uninhibited by floods. At Maziwa it was found that mangabeys emerge from the forest proper, making their way through the bush to feed on an unidentified seed-pod by the lake. Elsewhere they appear to keep strictly within the forest itself.

It is far harder to obtain an accurate estimate of the numbers of mangabeys than of colobus. Our observations at Mnazini lead us to think that about 90 individuals inhabit

the Mnazini I Forest—about the same number as of colobus. For the Home Forest we suggest a lower density; their distribution there is more localised, indeed we had been entering the forest daily for three weeks before we became aware of their presence. At least two troops live in the northern end of the forest, and it seems likely that at least 50 animals inhabit the whole forest. The other forest for which our own observations suggest a plausible figure is Hewani IV; here there is a single small troop consisting of at least five animals. For Wenje we accept the estimate of 90 animals given us by J-P. Simeon, a thoroughly reliable observer. The vocalisations heard there lead us to accept a density of this order. Similar considerations lead us to accept the figure suggested by K. J. Heribai for Maziwa of 160 animals, although this may perhaps be a little too high.

The density of mangabeys in these forests is between 2 and 4 animals per hectare. Based on these densities, and an estimated 733 ha of forest-woodland where mangabeys are known to occur, a maximum population estimate is arrived at of between 1466 and 2932 animals. Current work by Katherine Homewood (pers. comm.) suggests that the lower figure is more likely.

Cercopithecus mitis Wolf subsp. (*albogularis* group) Sykes monkey

This monkey was noted in troops of 6 to 12 in forests as far upriver as Bura, and away from the river in forests between Lango La Simba and Witu, in Witu Forest, inland from Lamu, and along the forests between Bodhei and Milimani; as well as in the bush areas surrounding the forests. Within the forests they were seen mainly in the trees, but at Bura and whenever they ventured into the bush zone (as at Lango La Simba) they were seen on the ground. The alarm call, a harsh "chak", was heard many times in a forest when the monkeys themselves were not seen.

Cercopithecus aethiops (L.) subsp. (*pygerythrus* group) Vervet monkey

This was the only monkey not observed in the forest itself, nor did vervets appear to venture far onto the grasslands. The typical habitat was woodland or thick bush. They also lived in or near cultivated areas wherever trees, including mangoes, were available for hasty retreat. Although different races have been described north and south of the Tana River, vervets seen at Maziwa (on the right bank) were not noticeably different from those commonly observed in the bush zone at the south end of the Home Forest (on the left bank), and these in turn were little if any different in colour from a juvenile male purchased at Vitengeni (on the western edge of the Sokoke Forest), near Malindi, and which lived as a pet and nuisance around our camp during the expedition's stay on the Tana.

Papio hamadryas (L.) subsp. (*cynocephalus* group) Baboon

Baboons were abundant along the Tana itself, and for as far as one went in either direction. They could be seen in a variety of habitats, but chiefly in the vicinity of forest or heavy bush. Troops varied in size from about 30 to at least 100, the latter size being apparently usual in the desert borderlands inland from Lamu. As everywhere, they are fearless crop-raiders.

The baboons of the Tana region and environs are very different from those seen in 1971 in the Usambara Mountains, near the coast of N.E. Tanzania. Though both have the lanky build and relative manelessness of the "yellow" group of subspecies, the Tana baboons are rather less lanky, and darker, browner than the Usambara baboons which are really yellow. Even in adult males, the naked skin on the lateral parts of the rump is pinkish, not blue-black as in other East African baboons, both yellow and olive. This pink colour seemed to vary with locality, being seen on the up-river baboons (near Garissa), and lower down on the left bank, but not in those of the bush country between Garsen and Malindi.

Galago zanzibaricus Matschie   Zanzibar bushbaby

Kingdon (1971) has suggested that this is a full species, distinct from *G. senegalensis*, and that supposed specimens of *G. demidovii* from the eastern coastal forests are the juveniles of same species. This appears plausible to us, in that we were able to observe quite closely a bushbaby in the Mnazini I Forest that had legs not very different in colour from the body, and so differed strongly from the typical *G. senegalensis* seen in the bush country.

Small mammals

Traps were set for a total of 1234 trap-nights in flood plain habitats. The total number of specimens caught was 83, giving 6.6 per cent success. Of the specimens caught, 37 were kept and measured. Seven species are represented, six murids and a shrew.

TABLE 5

Summary of trapping yield

	Home Forest	Grass-land	Munazini II Woodland	Hewani IV lake-side	Hewani Village	Total
Acomys subspinosus wilsoni	30	—	8	—	—	38
Thamnomys dolichurus	8	—	—	—	—	8
Paraxerus ochraceus	3	—	—	—	—	3
Praomys natalensis	—	9	3	6	2	20
Arvicanthis niloticus	—	1	—	—	2	3
Rattus rattus	—	—	—	—	9	9
Crocidura sp.	—	2	—	—	—	2
Totals	41	12	11	6	13	83
No. of trap nights	777	220	87	150	—	1234

TABLE 6

Trapping in the Home Forest

Habitat	Trap nights	*A.s. wilsoni*	*T. dolichurus*	*P. ochraceus*
Closed forest	226	9	3	—
Small tree forest	79	3	2	2
Bush forest	265	13	2	1
Grass clearing	50	2	—	—
Mimusops woodland	64	1	—	—
Fringing bushland	28	2	1	—
More than 1m off the ground	65	(1)	(1)	—
Totals	777	30	8	3

Most of the trapping was done in forest conditions, specifically in the Home Forest (see Tables 5 and 6). *Acomys subspinosus wilsoni* and *Thamnonys dolichurus* were the two common rodents occupying all types of forest and apparently extending into the bordering woodland and bushland. Neither of these are specifically forest rodents, and the absence of the forest rodents is in keeping with the impoverishment of the flora. Both are wide-ranging forms in Africa and presumably they have been able to occupy forest habitats in the absence of more strictly forest-adapted competitors. As a result of this the rodent fauna has no specific zoogeographic affinities with any particular region.

Grassland trapping totalling 220 trap-nights was divided between the eastern edge of the Home Forest (64 trap-nights) and the grass surrounding the camp site (156 trap-nights). There was no apparent difference between the two localities. The common rodent was *Praomys* (*Mastomys*) *natalensis*. A single *Crocidura* sp. was caught in a live trap, and one other specimen was found on the side of the grass track leading to the forest.

Woodland trapping was confined to the woodland zones of the Home Forest (64 trap-nights) and of Mnazini I (87 trap-nights). The two rodent species caught represent the two common species of forest and grassland, *A. s. wilsoni* and *P. natalensis* respectively. In this sense the woodland environment is intermediate between forest and grassland.

Finally, some trapping was done in a patch of cultivation forest bordering a small oxbow lake (Hewani IV). 150 trap-nights were put in, and only *P. natalensis* recorded. It seems likely that formerly in this area there had been forest, which was cleared at least 50 years ago according to local recollection. The small mammal fauna would have been wiped out and the area occupied by the grassland species *P. natalensis*. The common village rodent, *Rattus rattus*, was not found.

In addition to the trapping for small mammals, six wire-mesh cage-type carnivore traps were set out for a total of 248 trap-nights: 168 in the forest, 30 in grassland, and 50 at the edge of the rice irrigation scheme. Altogether 10 animals were caught and released: four *Atilax paludinosus*, two *Ichneumia albicauda*, and four *Genetta tigrina*. In spite of the disparity of trapping times, all of these, except for one genet caught in the forest and two mongooses (one of each species) caught in the rice-field, were taken in grassland.

Crocidura sp. White-toothed shrew

A single shrew of this genus was caught in one of our traps; it did not prove possible to identify it. It is apparently a grassland dweller in the Tana River region. Allen and Lawrence (1936) record three species of *Crocidura* from the lower Tana region.

Paraxerus ochraceus aruscensis (Pagenstecher) Huet's bush squirrel

Three specimens of this bush squirrel were caught, all in the Home Forest and all on the trunks of fallen trees. Additionally one of us observed two of this species on a fallen tree-trunk in a different part of the same forest, and a third in the undergrowth behind (some $1\frac{1}{2}$ metres off the ground). This species has an eastern distribution, and is widespread in eastern and central Kenya, Tanzania, and Equatorial Province of Sudan (Amtmann, 1966).

Paraxerus palliatus tanae (Neumann) Red bush squirrel

This was reported by informants to occur at Mnazini, and was probably the one we saw on one occasion at Wenje. This species also has an eastern distribution ranging from Somalia to South Africa.

Thamnomys (*Grammomys*) *dolichurus* (Smuts) Tree rat

This species was found only in forest conditions on the Tana. In one case it was caught more than 1 metre off the ground, but the other trappings were all on the ground. It is widely distributed in tropical Africa and generally lives in thickets and bushes along forest margins (Misonne, 1968). Living in these situations, the destruction or absence of any rodent forest fauna would enable it to move into the forest and colonise the forest niches left vacant. It seems likely that this has been the case on the Tana River. The species has been recorded from lowland evergreen forest in Uganda (Delaney, 1971). It has been claimed that it is replaced by *T. rutilans* in the forest, but this has not happened in that particular Uganda forest, as they both occurred there together.

Arvicanthis niloticus (Desmarest) Grass mouse

Two positively identified specimens were caught in Hewani Village. One other tentatively assigned to this species was caught in grassland on the edge of the ox-bow

lake at Hewani IV. The skin and measurements of this specimen show similarities with *Pelomys*, but the skull was lost and the specimen cannot be definitely assigned. *A. niloticus* is widely distributed in East Africa in grasslands. It is less common in West Africa, but occurs in Uganda and northeast Zaire (Misonne, 1968).

Rattus rattus (L.) House rat

This is now the dominant commensal rat in East Africa, having largely replaced *Praomys* (*Mastomys*) in this role. It was found only in the village houses on the Tana, and in general it is always found associated with man (Misonne, 1968).

Praomys (*Mastomys*) *natalensis* (A. Smith) Multimammate rat

This species reputedly lives in all sorts of environments in East Africa, but at the Tana River it was not found in forest. It was most common in grassland, but it also occupied woodland (where there is a grass ground covering) and lake edges (where there is also luxuriant grass growth). Interestingly enough, it is the commonest species in the Kafue River flood plain in Zambia (Sheppe and Osborne, 1971). In this area also it was found that this species lived only in grassland areas of the flood plain. The species is widely distributed in Africa south of the Sahara (Misonne, 1968).

Acomys subspinosus wilsoni (Thomas) Spiny mouse

This is by far the commonest species in the Tana River forests and woodlands; it apparently does not live in grassland or bush. In general the spiny mouse is considered an inhabitant of arid environments, and in Uganda is recorded only from dry savanna to semi-desert (Delany and Neal, 1966). Along the Kenya coast it has been recorded from the evergreen bushland south of Mombasa by Koch and in Gedi Forest by G. Rathbun (pers. comm. 1972) so that its habitat preference seems here to be quite different. One of the Tana River specimens was caught more than 1 metre off the ground, so that it may have some arboreal tendencies in the Tana River forests. The species is distributed throughout eastern and southern Africa, and the subspecies *wilsoni* is restricted to eastern Kenya (Setzer, 1968).

Lemniscomys griselda maculosus (Osgood) Striped mouse

This species was collected by Loveridge (Allen and Lawrence, 1936) at Wema and Ngatana, but was not recorded by us. Loveridge comments that it seems to be an uncommon species.

Some species of rodent are notable for their absence in the Tana River area. It is surprising that there was no *Thryonomys* in the area, but the same was found for the Kafue River flood plain (Scheppe and Osborne, 1971), and these authors speculated that it was unable to adapt to changing river levels; this would be equally true of the Tana. The absence of *Pedetes*, *Tachyoryctes* and other burrowers is more easily explained, again by reference to the Kafue situation, as due to the heavy clay nature of most of the soil, and its waterlogging after rain, to say nothing of the catastrophic effect of flooding on an underground animal. It was also expected to find the golden rumped elephant shrew *Rhynchocyon chrysopyus* living in the Tana forests. None were found, however, and it seems likely that the cause of their absence can be attributed to the poverty of leaf litter as a result of flooding.

Carnivores

Large carnivores are rare in the Tana River area because of hunting. Some evidence was seen or heard of the presence of lions *Panthera leo* (L.), leopards *Panthera pardus* (L).

and hyaenas *Crocuta crocuta* Erxleben, but none were actually sighted. Three species of viverried were trapped, and two others were seen, and in addition single individuals were seen of bat-eared fox *Otocyon megalotis* (Desmares), golden jackal *Canis aureus* L., and serval *Leptailurus serval* (Schreber) (see Table 7). Most of these hunt in the flood plain habitats, but only the marsh mongoose *Ichneumia albicauda* (G. Cuvier) and large spotted genet *Genetta tigrina* (Schreber) are found there consistently.

Ungulates

Sixteen species of ungulate were seen in the vicinity of the Tana River. Some, like the hippopotamus *Hippopotamus amphibius* L., are found only in permanent water on the flood plain, e.g. Lake Giritu. Another species, the red duiker *Cephalophus natalensis* (A. Smith), was seen only in the flood plain forests and is probably dependent on them for survival in this area. Other species use the flood plain habitats extensively, but their range also goes into the surrounding bushland, for example the topi *Damaliscus lunatus topi* Blaire, water buck *Kobus ellipsiprymnus* (Ogilby), elephant *Loxodonta africana* (Blumenbach) and buffalo *Syncerus caffer caffer* (Blyth). Finally there are several species that are common in the surrounding bushland but which were seldom seen in flood plain, for example oryx *Oryx gazella beisa* (Ruppell), gerenuk *Litocranius walleri* (Brooke), and zebra *Equus burchelli boehmi.*

TABLE 7

Casual sighting of mammals in the Tana River region

	Habitat	Presence on Flood Plain
Galago senegalensis braccatus Elliot	forest	X
Hystrix sp.	bushland	X
Manis sp.	edge of forest	X
Canis aureus L.	bushland	
Otocyon megalotis (Desmorest)	bushland	
Genetta tigrina (Schreber)	forest	X
Viverra civetta (Schreber)	bushland	
Ichneumia albicauda (G. Cuvier)	bushland	X
Atilax paludinosus (G. Cuvier)	river/grassland	X
Crocuta crocuta Erxleben	bush/grassland	X
Leptailurus serval (Schreber)	bushland	X
Panthera pardus (L.)	woodland	X
Panthera leo (L.)	bushland	
Orycteropus after (Pallas)	bushland	
Loxodonta africana (Blumenbach)	forest/bushland	X
Equus burchelli boehmi	bushland	
Diceros bicornis (L.)	bushland	
Potamochoerus porcus (L.)	forest	X
Phacochoerus aethipicus (Pallas)	bushland	
Hippopotamus amphibius L.	river/lake	X
Giraffa camelopardalis reticulata de Winton	bushland	
Syncerus caffer caffer (Spanman)	all types	X
Tragelaphus imberbis (Blyth)	bushland	
Cephalophus natalensis A. Smith	forest	X
Kobus ellipsiprymnus (Ogilby)	bush/forest	X
Oryx gazella beisa (Ruppell)	bushland	
Damaliscus lunatus topi Blaire	grassland	X
Madoqua kirki (Gunther)	bushland	
Litocranius walleri (Brooke)	bushland	
Gazella granti petersi Gunther	bushland	X

DISCUSSION

The most interesting problems associated with the Lower Tana River flood plain are zoogeographical ones. These will be discussed with reference to the geographical distribution of the flora and fauna and with particular reference to the Tana River

Red Colobus and Mangabey, the two primate subspecies endemic to the region. Some aspects of the ecology of the flood plain will then be discussed to see if they throw any light on the zoogeography.

Zoogeographical considerations

It has been seen that the flora consists mainly of endemic eastern forms and several with an East African to Asian distribution. There are a few species with general African distribution, but none that have strong West or Central African affinities. There are several genera that have many West African species and one East African species, notably *Oxystigma*, whose East African species is restricted to the northern end of the coastal forest zone. Finally, there is one species, *Populus ilicifolia*, with northern affinities, its nearest related species living on the Euphrates.

The faunal evidence is partly consistent with this picture. There is a preponderance of eastern coastal forms, but one or two elements are suggestive of other influences.

The fish of the Tana River are eastern forms and lack characteristic nilotic elements. This would seem to rule out any direct river connection between the Tana and the Nile system, including Lake Rudolf (Whitehead, 1959).

The avifauna has a strong endemic element as far as the East African avifauna is concerned. Such open country birds as the grass warbler *Cisticola restricta* (Traylor, 1967), the weavers *Euplectes diadematus*, *Ploceus bojeri* and *P. castaneiceps*, and the pipit *Anthus melindae* have ranges either centred essentially on the Tana or north and south of it on the maritime strip. The starling *Lamprotornis corruscus* occurs in the area in forest and dense woodland. All of these birds have small and circumscribed ranges. Many populations isolated in riverine and coastal forests in the region have even more restricted distributions, such as the weaver *Ploceus golandi* and the owl *Otus ireniae* (Sokoke Forest), the sunbird *Anthreptes pallidigaster*, the pipit *Anthus sokokensis*, and several populations differentiated at the subspecific level.

These isolates clearly show an affinity of the Tana and other northern coastal forests with the Central African lowland forest. The thrush *Neocossyphus rufus* is an example of a relic population of the Tana (where it is found commonly) and coastal forests, separated from the "parent" population in the Central African (Zaire) forest block by about 1000 km. The akalat (robin) *Sheppardia gunningi sokokensis*, endemic to the Sokoke and Tana forests, is closely allied to two other highly circumscribed races in northern Malawi and the Beira area—a remarkable example of disjunct distribution. Two other birds with disjunct ranges that have been recorded from the lower Tana (although not during the present survey) are the sunbird *Anthreptes neglectus* and the warbler *Apalis chariessa* (Keith, 1968). Populations of some other species are endemic to the Lower Tana forests alone, e.g. the owls *Otus scops nivosus* and *Bubo africanus tanae* (Keith and Twomey, 1968).

In the avifaunal list (see Table 4), species marked with an asterisk inhabit forests of several floristic designations and are more or less widespread wherever suitable cover occurs in East and Equatorial Africa. Species marked with a double asterisk are geographically restricted, and their occurrence on the Tana indicates first a distant affinity with the Central African lowland forest and secondly a close affinity with the nearest forest outlier, the Sokoke. Lying 130 km to the south, and separated by savanna woodland and steppe, the Sokoke has been isolated for much longer than the Tana forests, as evidenced by its greater endemicity (Ripley and Bond, 1971).

The mammal fauna also is dominated by forms with eastern relationships. *Cercopithecus mitis* and *Acomys subspinosus* are species widespread in East and South Africa, but the subspecies groups represented on the Tana are of East African coastal affinities. Some species, notably *Galago zanzibaricus* and *Paraxerus palliatus*, are found only in the forest areas along the east coast, through extending as far south as Mozambique or Natal. A few species, notably *Paraxerus ochraceus*, do not extend so far south and instead

occupy a northeastern range (Kenya, Tanzania, into Sudan). There is only one endemic, *Damaliscus hunteri*, and that is not found on the flood plain itself. In contrast to these, the colobus, mangabey and duiker races of the Tana show direct links with Central Africa. In view of the importance of this relationship for zoogeographic studies, each will be described separately.

Cercocebus galeritus is known from Zaire, and extends to the west across the Congo-Ubangui system to Rio Muni. Eastwards, it has not been recorded from Uganda nor from Tanzania, so that there is a gap of over 1,000 km between the Tana population and its closest relatives. The Tana race, *C. g. galeritus*, is externally not strikingly different from that found on the north bank of the Congo River, *C.g. agilis*, being somewhat paler in colour with longer hairs on the brows. No other mangabeys inhabit any of the eastern coastal forests and even those of Uganda, *C. albigena*, belong to a species not closely related to *C. galeritus*.

Cephalophus natalensis is widespread in East and Central Africa from Natal in the south to Somalia (Juba River) in the northeast, and to the Congo and Ubangui Rivers in the northwest. Within this range there are two well-marked subspecies-groups, differing in size, colouration and other features. The *harveyi* group, with its characteristic dark face-blaze and dark legs, is found from the southern highlands of Tanzania, north and northwest. The exact subspecies found on the Tana remains to be determined, but is certainly of the East and Central Africa groups, not the selfcoloured *natalensis* group of the more southerly forests.

The *Colobus badius* case is perhaps the most interesting of all. The eastern races of this species extend from the Zaire forests down the forests bordering the lakes of the western Rift in Uganda and Tanzania, and have three isolated populations further east: the Uzungwa range (Iringa district) in Tanzania; on Zanzibar; and on the Tana. The apparent interrelationships of these three forms, and their relationship with *C.b. tephrosceles* of the Rift Valley lakes, are well brought out by Kingdon (1971): the Uzungwa race *C.b. gordonorum* closely resembles *tephrosceles* but is blacker above, with a tendency for the lumbar region to be red-tinged and for the shanks to be grey-white; the Zanzibar race, *rufomitratus*, is paler, lacks any red on the body, and is essentially a "washed-out" version of *tephrosceles*. The tendency, in addition, for the northerly (Ugandan) populations of *tephrosceles* to be paler than the southerly (Tanzanian) ones, reinforces the conclusion that the Tana and Zanzibar/Uzungwa types of red colobus are related not to each other but to the geographically nearest *tephrosceles* populations.

Combining the data from plants, birds and mammals, then, we end up with a picture of the geographical relationships of the Tana as follows:

1. a large pan-African element; or at least, taxa so widespread in Africa as to be of no use in assessing affinities.
2. an equally large element specific to the eastern coastal forests. This implies that these forests, as a whole, have been isolated long enough from the central African forests to have developed a characteristic facies; and suggests as well that the coastal forests were at one time more continuous.
3. a small component, in plants only, with extra-African affinities.
4. an endemic component, mostly birds, and not entirely forestliving.
5. a small but intriguing element of Central African affinities; not necessarily confined to the Tana forests, but not extending very far south along the coast.

This has interesting consequences for the study of past climates and vegetation patterns in Kenya. The likelihood of a northern forest dispersal route between Central Africa and the eastern coastal region must be considered, in addition to the agreed southern dispersal route which still exists, though patchily, via the southern highlands of Tanzania, the Zambia-Zaire border area, and northern Anglola. Among the primates for example, *Cercopithecus mitis* is evidently a southern-route form, which has pushed as far north along the coast as the Webi-Shebeli system in Somalia; *Colobus angolensis*, another southern-route species, has reached Kilifi Creek (specimens in the British

Museum from Takaungu) but no further; *Colobus badius* may have followed another route and has apparently been replaced along most of the southern route by *C. angolensis;* and *Cercocebus galeritus* has no intermediate populations at all such as would be expected still to remain if it followed the southern route.

It should be emphasised at this point that the "northern route" is so far a working hypothesis only; essentially it is a model proposed to explain the distributions of two species of primate. The alternative—on the basis of the southern route only—would be to suppose that *Cercocebus galeritus* was formerly distributed throughout the north-eastward band of forests running from Lake Tanganika via Lake Rukwa, the Uzungwas, Ulungurus, Ngurus, Usambaras etc., but has since become extinct for reasons unknown throughout this wide area. Similarly, red colobus of the bicolor *tephrosceles-rufomitratus* type would have inhabited this area but were subsequently replaced by conspecifics of the tricolor *kirkii-gordonorum* type. It must be borne in mind that still too little is known of the ecology of either mangabey or red colobus to rule out such a possibility; it is conceivable, for example, that *Cercocebus galeritus* is adapted to forests subject to periodic flooding, and that rivers (such as the Pangani) along the southern dispersal group did at one time regularly flood. It is also possible that different subspecies of red colobus occupy slightly different niches, so might replace one another as the habitat changed.

Ecology of the flood plain

The Tana River flood plain, with its high water table and frequent flooding, is by far the most productive habitat along the north Kenya coast. The ground-water forests of Witu to the north are similar in structure to the Tana forests, but there is a much greater West African element in the flora, and the fauna is less diverse. The Sokoke Forest to the south is richer both floristically and faunistically, and seems to be the centre of endemicity, especially for bird species, for the Kenya coast. In neither of these forests to north and south of the Tana River does the red colobus and mangabey live, and this is hard to explain in view of the greater affinity of these forests with the West African ones than with the Tana River forests.

The composition of the fauna in the grassland areas of the Tana River flood plain has many similarities with that of the Kafue River (Sheppe and Osborne, 1971). The use by large mammal species of the flood plain habitats is limited to those species that live in the region anyway, but the exclusion of certain groups of animals from the flood plain follows the same pattern and can be attributed to the same reason as for the Kafue flood plain (Sheppe and Osborne 1971). Browsing ungulates are in general excluded not only from the grasslands but also from the forests because of the lack of undergrowth; burrowing species that are characteristic of sandier soils are excluded, as are forest-living elephant shrews that build nests of leaf litter; ants and termites are relatively uncommon, and except for one pangolin *Manis* sp. no ant-eating species were seen nor any evidence for their presence.

The forests and woodlands along the Tana River are dominated by the monkeys, of which five species frequently occur in one forest. These are either completely arboreal or at least capable of becoming so, and as a result they are comparatively unaffected by flooding of the forest. The small carnivores seen are also either partly arboreal (e.g. genets) or partly amphibious (e.g. marsh mongoose). The most common forest-living rodent, *Acomys subspinosus*, is not generally considered a forest rodent, but it was found once some distance off the ground, as was the forest rodent *Thamnomys dolichurus*. *Praomys* (*Mastomys*) *natalensis* is the most common grassland rodent, as it was on the Kafue River flood plain (Sheppe and Osborne, 1971), but it was also found on occasion in woodland areas, where it probably takes refuge during the flooding. Most of the forest fauna, therefore, is at least potentially arboreal, and there are none of the ground-restricted animals, such as *Rhynchocyon*, *Petrodromus*, *Lepus* or *Crycetomys*, found elsewhere along the Kenya coast. One exception to this is the red duiker, but presumably this moves out into the surrounding bush when the forests are flooded.

It would appear that these exceptional conditions in the Tana River forests must be related to the survival there of the Central African species of red colobus and mangabey, but the nature of the relationship is still obscure. No other coastal forest has as rich a higher primate fauna as the Tana River: the Witu and Sokoke forests have three species only (including the baboon); the former Kilifi forest and the Jadini forests to the south have four species, increased by one by the black and white colobus (*Colobus angolensis*); and the former lowland forest of the east Usambaras in Tanzania, incomparably richer in every other respect than the Tana forests, had only four species of higher primate. The contrast is puzzling of the rich primate fauna in the Tana River forests, with two Central African species, to the fauna and flora, which indicate lack of Central African influence and are very impoverished even for the Kenya coastal forests, themselves relatively impoverished. The one feature by which the Tana forests differ from those of the other coastal forests is their transient nature. It was suggested in the description of the environment that the forest patches on now defunct channels of the river are slowly drying and that new patches would be in process of formation were it not for fire. This environmental state of continual change is suggested by Katherine Homewood (pers. comm. 1973) to be that to which the mangabeys particularly are best adapted and is the reason for their survival at the Tana River.

TABLE 8

Full names of plant species when not given elsewhere

Dobera loranthifolia (Warb.) Harms
Albizi anthelmintica Brough.
Suaeda monoica J. F. Gmel.
Salvadora persica L.
Spinostachys africana Sond.
Acacia xanthophloea Benth.
Sterculia appendiculata K. Sch.
Gyrocarpus americanus Jacq.

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Finally, we are especially grateful to the National Geographic Society of America, who financed the whole expedition; and especially to Dr. Leonard Carmichael, its chairman.

SUMMARY

The results are presented here of a two month ecological survey of the Lower Tana River, Kenya. The annual floods of the Tana River support a unique assemblage of flora and fauna on the lower flood plain which differs greatly from the rest of the coastal area, where the climate is generally hot and dry. Both pastoralists and agriculturalists inhabit the flood plain and to a certain extent depend on the floods for their living. Edaphic forests and woodlands are scattered along the lower flood plain; these were investigated in some detail as to their plant, bird, and mammal life, and the zoogeography of the region was considered with reference to the two endemic subspecies of monkey—Tana River Mangabey and Tana River Red Colobus—that live there. The ecology of the forests was found to be greatly impoverished, both floristically and faunistically, and this is taken to be sufficient cause for the strongly local element in both flora and fauna, and for the lack of West African species. Faunal routes between the east coast and West Africa are briefly discussed, and it is concluded that the distribution of the two endemic monkeys is not consistent with the evidence of the southern route through Tanzania.

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THE AFRO-ALPINE GREY DUIKER OF KILIMANJARO

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ABSTRACT

Between September 1967 and September 1969, the Grey Duiker, *Sylvicapra grimmia* Linn, was studied in the Afro-alpine zone of Mount Kilimanjaro. Three specimens were collected which are described and compared to Grey Duikers living in other East Africa alpine areas and on nearby lowlands. Data on habitat relationships, density, and distribution are presented along with observations on reproduction, behaviour, and feeding habits.

Older records suggested that at least 4 species of small antelope lived on upper Kilimanjaro but evidence collected in this study indicates that only the Grey Duiker is present. This duiker may represent an undescribed race of *Sylvicapra grimmia* for the following reasons: a) geographical isolation, b) ears more squarely tipped than neighbouring races, c) very short tail compared to other races, and d) very short nasal bone compared to other races. However, additional specimens are needed before a final conclusion is made.

The duiker on upper Kilimanjaro is most abundant between 3,300 and 3,800 m in areas that are relatively level, open, and well disected by drainage lines. A density of not less than 1.80 per km^2 occurred in a good habitat while an estimated 0.5 per km^2 or less occurred in a poor habitat. Succulent shrubs and herbs such as *Alchemilla* and *Ranunculus* spp. appear to be the most important foods. Evidence suggested breeding occurs throughout the year and that juvenile mortality was probably very high.

INTRODUCTION

The purpose of this paper is to describe the Grey Duiker *Sylvicapra grimmia* Linn. found on upper Kilimanjaro; to compare it to those found in other East African Afro-alpine areas; and to give details of its biology, behaviour, abundance, and distribution. Within East Africa, the fauna and flora of Kilimanjaro is perhaps as well known as that of any other area due to intense interest in the mountain by geographers, explorers, botanists, ornithologists, museum collectors, and others from the earliest days of European entry into the area. It is, therefore, surprising that the presence of the Grey Duiker on upper Kilimanjaro was not realized until 1948 (Swynnerton 1949). Moreover, it is surprising that a specimen was not collected and made known to science until now.

The Grey Duiker has been known to science for more than two centuries but it was not until the early years of the 20th century that its presence in Kenya and Tanzania was recognized. The first review of the races in northern Tanzania and Kenya was probably provided by Roosevelt and Heller (1914). They recognized *deserti* Heller, *altivallis* Heller, *hindei* Wroughton, and *nyansae* Neumann. A fifth race, *lobeliarum* Lönnberg was described by Lönnberg (1919). Haltenorth (1963) lumped *hindei* with *nyansae* which Ansell (1968) followed in the recent review of African mammals by the Smithsonian

Institute. Briefly, the races can be divided into those that live in the sub-alpine and alpine zones—*lobeliarum* and *altivallis*—and the remainder which live in the bushlands of lower elevations. *Nyansae* (*hindei*) is the lowland race found near Mount Kilimanjaro and probably occurs to the north, west and south (Roosevelt and Heller 1914; Haltenorth 1963). The mountain races are characterized by very long shaggy hair and shorter ears while those from the lowlands have fine short hair and relatively long ears. The Grey Duiker of Kilimanjaro clearly belongs to the former group.

The specimens and observations of the Grey Duiker of Kilimanjaro used in this paper were collected between September 1967 and September 1969 when I was on the staff at the College of African Wildlife Management at Mweka, Tanzania. Approximately 20 trips were made to the moorlands above the forest with all slopes of the mountain being visited at least once. Grey Duiker were seen regularly and three specimens were collected. The first was taken November 8, 1968, by F. Poppleton and the other two by the author on July 4, 1969. All came from the west shoulder of Kilimanjaro, the Shira Plateau, at approximately 3,600 m. One was a male and two were pregnant females. An animal upon collection was weighed, measured, and then skinned. The skin was removed with feet and head attached and later tanned at the Wildlife College. The stomach contents, the skull and, in the case of the females, the reproductive tract were removed for later processing. Also included are observations provided by the staff and students of the Wildlife College from visits to upper Kilimanjaro in 1970, 1971, and 1972; and the results of a census carried out in February 1970, on the Shira Plateau.

In order to carry out meaningful comparisons with the sub-species *nyansae* on the plains around Kilimanjaro, a female was collected at Namanga, 70 km northwest of the mountain, and to compare the Kilimanjaro Grey Duiker with the subspecies *altivallis*, the Director of Kenya National Parks, P. Olindo, kindly permitted a female to be collected from the moorlands in the Aberdare National Park. This was done by P. Duncan under the direction of the park warden, W. Woodley. To supplement these specimens, I examined the large collection of Grey Duiker skins and skulls in the National Museums of Kenya which included a specimen of the race *lobeliarum* from Mount Elgon. Wroughton (1910) and Heller (1912) were consulted, respectively, for type descriptions of *hindei* and *altivallis*, and Hollister (1924) for additional sub-species body and skull measurements. Lydekker (1914) also provided useful information.

HISTORICAL NOTES

Small antelope were seen by a large number of visitors to the moorlands of Kilimanjaro (Johnston 1886: 355, Meyer 1890: 118 and 158, Gillman 1923, Guest and Leedal 1954: 45, Miller 1934, Child 1965: 87, Swynnerton 1949: 11, and others). Usually the small antelope were identified as being Klipspringer (*Oreotragus oreotragus* Zimmerman) or Mountain Reedbuck (*Redunca fulvorufula* Afzelius).

Most of the early reports of Klipspringer and Mountain Reedbuck are based on sight records and, except for Swynnerton's (1949), are readily dismissed. Swynnerton, however, noted both Mountain Reedbuck and Grey Duikers in his 1949 paper. Swynnerton was a very competent observer but an examination of his personal diary of the trip (in the library of the Wildlife College), indicates his conclusion that Mountain Reedbuck existed high on Kilimanjaro was based on an indefinite sighting by one of his companions and on one indefinite set of spoor. Swynnerton (1949) also included Bushbuck *Tragelaphus scriptus* Pallas and Harvey's Duiker *Cephalophus harveyi* Thomas in his list of animals for Shira Plateau but his diary shows that he saw no sign of either above 2,700 m., the forest edge. Both of these species, however, do occasionally go above the treeline. (Child 1965, *pers. obs.*).

In researching old records I was able to find only one record of a duiker having been shot at a high elevation on Kilimanjaro. This was by Sir Harry Johnston in 1884 (Johnston 1886) and is of considerable historical interest. Johnston kept neither skin

nor skull of his animal but did make a drawing of its head which appears on page 355 of his book. The drawing is unmistakenly that of a Grey Duiker. However, on the basis of this drawing, O. Thomas identified the animal as likely a race of the long snouted Duiker (*Neotragus kirkii*), the animal now known as Kirk's Dikdik *Rhynochotragus kirkii* Gunther. The dikdik had first been recorded only four years earlier in Somaliland. Moreau (1944), on the basis on Johnston's report, included dikdik in his list of mammals for Kilimanjaro, however, it was dropped by Child (1965). It is most unfortunate that Johnston did not retain the skin or skull for this would have been the first record of the species north of Mozambique. Moreover, had the animal been correctly identified, the misidentifications and uncertainty regarding the 'small antelope' of the moorlands of Kilimanjaro would not have persisted to the present day. As a result of the intensive field work on upper Kilimanjaro during 1967–69, additional observations from 1970–72, and examination of old records, I am now convinced that the only small antelope residing at high elevation on Kilimanjaro is the Grey Duiker.

THE KILIMANJARO GREY DUIKER

General appearance and colouration

The most striking feature of the Grey Duiker from upper Kilimanjaro is the heavy course shaggy hair (Plate 1). This feature is shared with *altivallis* and with *lobeliarum* and contrasts sharply with the fine short hair of the lowland races. The hair of the back of the specimens from the three mountains averages about 30 mm length with the guard hairs being 45–50 mm. This is nearly twice the hair length of the *nyansae* specimen from Namanga and others examined. The belly hair is similarly lengthened and is woolly and dirty white rather than straight and white.

Plate I

The ears of the Grey Duiker from Kilimanjaro are relatively short with the tip 'squared off' (Plate 1). This feature was also noticed by Johnston (1886) and appears

in his drawing. The ear of my Aberdare specimen is blunted, but not to the extent of the Kilimanjaro animals, and that of the Elgon specimen is pointed. Finally, the mountain duikers appear heavier and stockier in relation to body length than the animals from the lowlands. This is discussed more fully in the next section.

There is considerable variation in the colouration of the three specimens from Kilimanjaro. The first female collected is dark grizzly grey above and heavily vermiculate whereas the second female is much more russet and with little speckling. The male is between the two females in general colour. Variation in colour was also observed in the field. The specimens of both *nyansae* and *altivallis* are similar to the Kilimanjaro animals while the skin of *lobeliarum* is more of a tawny russet with almost no speckling. However, the skin of *lobeliarum* may not be typical as Lönnberg in Lydekker (1926) describes the type specimen as being 'greyish buff with a grizzled effect being evident on the back.

The nasal-coronal blaze and the blazes down the forelegs also show considerable variation in extent, from virtually none on the first female collected to full blazes on the second female. The feet and blazes of all three Kilimanjaro Grey Duikers are very dark brown or shiny black. The Aberdare animal is similar in these respects but *lobeliarum* and *hindei* have blazes and feet that are a chocolate brown.

Body measurements

The external body measurements of the Grey Duikers found on Kilimanjaro are basically the same as those of its cousins found on the nearby lowlands and on the Aberdare Mountains. Table 1 compares the measurements of the individuals from the Shira Plateau with those of the Aberdare and Namanga specimens, and with additional measurements of *nyansae* (*hindei*) and *altivallis* taken from Hollister (1924). The only measurement which shows consistent variation between races is tail length. The Kilimanjaro specimens have relatively short tails compared to all others.

TABLE 1

Body measurements of 3 Grey Duikers (*Sylvicapra grimmia*) from Shira, *nyansae* from Namanga, and *altivallis* from the Aberdares; and of additional specimens of *altivallis* and *nyansae* from Hollister 1924. a = from Hollister

Subspecies	*1-*	*2-*	*3-*	*nyansae*	*nyansae*[a]	*altivallis*	*altivallis*[a]
Locality	Shira	Shira	Shira	Namanga	—	Aberdares	—
Altitude (m)	3,500	3,600	3,530	1,300	—	3,050	—
Date Coll.	8-11-68	4-7-69	4-7-69	31-7-69	—	2-9-69	—
Time Coll.	1650	0900	1450	0300	—	day	—
Collector	Poppleton	King	King	King	—	Duncan	—
Sex	female	male	female	female	1 male 4 female	female	2 male 2 female
Age	adult	adult	adult	adult	adults	adult	adults
Weight (gm)	1363	1360	1455	1273	—	1382	—
Foetus wt. (gm)	9	—	143	6	—	23	—
Rumen wt. (gm)	50	50	200	200	—	170	—
H. & B length (mm)	880	810	820	875	905(800–970)	880	890(820–940)
Shoulder ht. (mm)	560	560	540	550	—	560	—
Hindfoot lt. (mm)	260	265	260	264	269(253–287)	280	269(265–270)
Heart girth (mm)	520	540	490	490	—	475	—
Crown rump (mm)	—	650	650	710	—	710	—
Tail length (mm)	95	95	96	125	122(100–153)	125	105(100–110)
Ear length (mm)	110	96	97	102	110(97–130)	100	105(100–109)
Ear width (mm)	55	52	52	53	—	55	—

The body measurements were examined to see if the duikers from higher elevations were, in fact, stockier and heavier than their lowland cousins as they appeared (Table 1). The weight per unit body length is greater in the high elevation specimens but the data are inconclusive as three were females in varying stages of pregnancy. Heart girth relative to head plus body length is largely independent of reproduction condition. This ratio (Table 1) is clearly greatest in the Kilimanjaro individuals at about 0.60 for the two females and 0.67 for the male as opposed to 0.55 for *nyansae* and *altivallis*. Although the differences are not great, these combined with the heavy coat does give credibility to the general impression of a stockier and heavier animal at high elevations on Kilimanjaro.

There were no differences in the size or shape of the hoofs of the different races. Those of *lobeliarum*, *nyansae*, and individuals from Kilimanjaro are, however, much more worn than those of the specimen from the Aberdares. Undoubtedly, this is a result of the different substrates the animals walk on.

Skull measurements

Skull measurements of two of the specimens collected on Kilimanjaro (the skull of the female collected by Poppleton was inadvertently lost) were compared with the skull measurements of *nyansae* and *altivallis* (Table 2). As with the body measurements, those of the Kilimanjaro skulls generally do not vary from those of other races. However, a difference appears to exist in the nasal bones. The nasal bones of the Kilimanjaro specimens are shorter in relation to width (0.61) than those of almost all other Grey Duiker skulls examined. Five *altivallis* (4 from Hollister 1924) averaged 0.53 (0.51–0.56), six *nyansae* (5 from Hollister 1924) averaged 0.54 (0.51–0.57), and six *deserti* and *roosevelti* (Hollister 1924) averaged 0.51 (0.46–0.55). I also examined the width/length ratio of the nasals of 25 skulls in the National Museums of Kenya. They came from various lowland locations. Four of the 25 had ratios greater than 0.57. Three of the four had a nasal wider than average (32 vs 29 mm) but with normal lengths. Only one, an adult male (KNM No. 301) had the greatly shortened nasal of the two Kilimanjaro specimens. The actual difference between the skulls from Kilimanjaro and all others with the one exception is in the length of 'free' nasal, that is, the nasal extending beyond the nasal-premaxillary notch. The 'free' nasal is approximately 5 mm shorter on the Kilimanjaro skulls.

TABLE 2

Skull measurements (mm) of 2 Grey Duikers from Kilimanjaro, *nyansae* from Namanga, and *altivallis* from the Aberdares, and of additional specimens of *nyansae* and *altivallis* from Hollister 1924. a= from Hollister

Subspecies	*Shira 2*	*Shira 3*	*nyansae*	*nyansae*[a]	*altivallis*	*altivallis*[a]
Sex	male	female	female	2 male 3 female	female	2 male 2 female
Greatest length of skull	165	163	161	167(158–174)	160	164(157–168)
Condylo-basal length	151.5	153.5	151	155(148–162)	157	154(145–159)
Palatal length	81	79	82	79(75–86)	85	79(72–82)
Greatest breadth of skull	76	79	75	—	77	—
Zygomatic breadth	75	75	70	74(72–76)	73	76(74–77)
Mandible length	129	124	131	125(118–133)	134	125(120–130)
Maxillary tooth row length	48	44.5	44	48(45–50)	50	48(45–50.5)
Mandibular tooth row length	52.5	49.5	46	53(49–55)	50	51(48–56)
Nasal breadth	31	29	30	29(28–31)	28	28.5(27–31)
Nasal length	49	49	54	56(53–63)	52	54(50–58)
Ratio of the width to length of the nasal	0.63	0.59	0.55	0.52 (av.)	0.54	0.53(av.)

Only males possess horns. The horns of the adult male from Kilimanjaro lay at an angle of 170 degrees to the face. The lengths of the horns along the front curve were 117 (left) and 114 mm. An old skull found by Swynnerton (1949) had horns approximately $5\frac{3}{4}$ inches (145 mm) long. Other individuals seen in the field appeared to have horns longer than those which Swynnerton found.

Evolution

Lydekker (1926: 150) suggests that *altivallis* has arisen from *hindei* (*nyansae*). In reviewing the similarities in colouration and other characteristics that the Grey Duiker of Kilimanjaro shares with *nyansae* and *altivallis*, it would appear that it, too, has probably evolved from *nyansae*. However, as Kilimanjaro is separated from the range of *altivallis* by nearly 400 km, which includes bands of dense forest and open grasslands, *altivallis* and the Kilimanjaro Bush Duiker likely arose independently. This independent evolution is supported by the apparently consistent differences between *altivallis* and the Kilimanjaro animals in length of the nasal and the tail and in the shape of the ear. Based on these differences, the Grey Duiker from upper Kilimanjaro may represent an undescribed race, but more specimens are necessary to confirm this hypothesis.

BIOLOGY

Habitat and distribution

The Grey Duiker of Kilimanjaro is resident from the treeline at 2,900 m (2,600 on West Kilimanjaro) up to 4,600 m. Remains have been found as high as 5,500 m (Meyer 1890). It is not, however, equally distributed within these altitudes or on adjacent slopes. There are very few animals in the thick heath zone (*Erica*, *Philippia*, *Adenocarpus*, *Hypericum* spp.) from the treeline to 3,300 m. In this zone individuals are rarely seen and signs such as spoor and dung are uncommon. Above 4,100 m the duiker is also uncommon and it is only in favourable areas like the southwest slopes of Kibo and Mawenzi that it regularly occurs over 4,300 m. Thus the preferred altitude range is 3,300 m to 4,100 m. Even within these limits there are areas like the dry north slope of Kibo where the duiker is scarce.

Undoubtedly, the most favourable area on Kilimanjaro for the Grey Duiker is the Shira Plateau. This plateau of some 55 km^2 between 3,300 and 3,800 m on the west slope of Kilimanjaro abounds in duiker and it is not unusual to see several in a day. The Shira is a relatively level plain dominated by an open heath, ever-lasting (*Helichrysum* spp.), and grass (*Deschampsia*, *Koeleria* spp.) community except for a large boggy moorland dominated by sedges and tussock grasses. In this open moor-land, and in the many damp drainages that dissect the plateau, succulent herbs and shrubs (*Alchemilla*, *Ranunculus*, etc.) are common. Salt (1954) provides a more complete description of the area. Elsewhere on Kilimanjaro, the duiker is most frequently seen in the wide valleys such as those of the Kikafu and Umbwe Rivers. Individuals and signs are rare on the drier ridges and moraines between valleys and on dry open slopes.

Numbers

The Kilimanjaro Bush Duiker appears to be a solitary animal as it is rarely found in pairs. Of nearly 75 records only four times were two individuals seen together. It may be that both males and females occupy territories as I have several records where an animal was seen at the same locality on two or more occasions over a period of months. The animals were unmarked but consistent patterns of behaviour strongly suggest they were the same.

On the Shira Plateau I saw an average of three (1–8) animals per day (11 days). Similar numbers were also seen by other observers in the same area. To get a measure of

density on the plateau, a census was carried out by students and staff of the Wildlife College on February 16, 1970. A modified King Census was used (Hemingway in prep.) and gave an adult population density of 1.80 per km^2. Interestingly, a similar census done by the Wildlife College in *Pseudolachnostylia* woodland (a Miombo type) at Kingapira in the Selous Game Reserve, September 15, 1969, gave a density of 2.04 per km^2. Both must be considered minimum densities. The closeness of these results in apparently optimum habitats without exploitation suggests that behaviour may be limiting numbers.

Over the remainder of Kilimanjaro, the density is almost certainly lower, probably less than one per 2 km^2, as there are the large tracts of poor habitat. Nonetheless, even at the lowest density, the Grey Duiker is still the most numerous large animal on the upper slopes of Kilimanjaro. The only other resident ungulate, the eland, is unlikely to exceed 50 individuals on the whole mountain (unpublished data). In a personal communication (September 2, 1969) W. Woodley and P. Duncan report seeing four individuals feeding regularly in an area of about 0.75 km^2 in the Aberdares.

Reproduction and recruitment

The Grey Duiker of Kilimanjaro appears to breed throughout the year as the females collected in both November and July were pregnant. The July foetus was near term as it had a crown-rump length of 33 cm and weighed 3.15 lbs.(1.43 kg), which is close to the 3.2 lbs. (1.45 kg) and 30 cm reported by Wilson and Clarke (1962) for new born. The foetus of the second female from Kilimanjaro and those of the Namanga and Aberdare females were in earlier stages of development.

In all the trips I made to upper Kilimanjaro not once did I see a young duiker either alone or with its mother. Apparently the females keep their young well hidden until well grown. It is also possible that there is a high death rate which tends to reduce the number of visible young. High juvenile mortality could account for the high pregnancy rate (4/4) of the females in this study and the 51 percent (48/94) reported by Wilson and Clarke (1962). On Kilimanjaro there are several predators including the Serval (*Felis serval* Schreber), the Leopard (*Panthera pardus* Linn.), the Lammergeyer (*Gypaetus barbatus* Linn.), and Wild Dog (*Lycaon pictus* Temm.) (Child 1965, Lamprey 1965).

Habits

Most duikers are seen in the early morning or late afternoon. It is unusual to see an animal before it sees you and the majority are only antelope bounding out of sight. They tend to flush at long distances in relatively open habitat. The average distance was 151 m in the census taken in 1970. Once flushed, the duiker rarely stops until out of sight even if it is three to four hundred meters away across an open moor. These behaviour patterns are likely the reason the animal was incorrectly identified by so many people, and why it was not collected more frequently.

Through the day most animals rest in shrubby areas rather than in the open. However, I have five records of duikers being 100 m or more from bushy cover of any kind at midday. In three cases the animal was lying down while in the other two they were moving and feeding. Roosevelt and Heller (1914) say that *altivallis* in the Aberdares leaves the heath bush only at night to feed on areas of open moor but their conclusion was likely the result of insufficient observations. Animals surprised out in the open dashed for cover although not necessarily the nearest.

When feeding, an individual moves without definite direction and stops here and there to take some item. About every 30 seconds the head is suddenly raised probably to look for danger. Yet, one afternoon I was able to stalk within 50 m of a male on open moor by moving only when the animal's head was down. It struck me that a similar approach by a predator could have been successful.

Food

The rumen of the first female collected was the only one that contained plants that were not digested beyond recognition. Her rumen contained the leaves and shoots of *Ranunculus oreophytus* Del., *R. volkensii* Engl. and *Alchemilla johnstonii* Oliv. The rumen contents of the Aberdare female were also highly digested, however, Roosevelt and Heller (1914) note that the chief food of an animal Roosevelt collected in the Aberdares was *Alchemilla argynophylla* Oliv. These very limited data suggest that the Grey Duiker of the mountains prefer the more succulent vegetation to be found in damp areas. The presence or absence of preferred food is probably one of the more important factors affecting the distribution of the Grey Duiker, and perhaps density. It has been pointed out that on Kilimanjaro the duiker is most plentiful on the Shira Plateau and in the broad wet valleys while it is very uncommon on dry slopes and ridges.

The rumen of the Namanga female was filled with the fruits of *Solanum* sp. This fruit was probably the most succulent item of food available in July in that area.

SUMMARY

a) Present evidence indicates that the only small antelope of upper Kilimanjaro is the Grey Duiker. This study found no evidence to suggest that either Klipspringer or Mountain Reedbuck occur at high elevations as has been reported in earlier papers (Child 1965, Swynnerton 1949).

b) The Grey Duiker of upper Kilimanjaro may represent a previously undescribed mountain race of *Sylvicapra grimmia* for the following reasons:

1) geographical isolation from other mountain races,
2) ears more squarely tipped than *altivallis*,
3) a short tail compared to neighbouring races, and
4) a nasal bone that is shorter in relation to width than in other races.

c) The Kilimanjaro Grey Duiker is most abundant between 3,300 and 3,800 m in areas of relatively open and level terrain dissected with drainage lines.

d) The duiker appear territorial and occur at a density of about 1.80 per km^2 in good habitat.

e) Breeding occurs throughout the year. There appears to be a high juvenile mortality rate.

f) The chief food appears to be succulent herbs and shrubs with *Ranunculus* and *Alchemilla* spp. being particularly important.

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A CONTRIBUTION TO THE BIOLOGY OF THE PIED CROW *CORVUS ALBUS* MÜLLER IN UGANDA

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INTRODUCTION

The Pied Crow is the most widely distributed corvid in Uganda. It occurs in virtually all parts of the country, but especially in association with human settlements. The population of these birds in Kampala has been estimated to be between 600 and 800 birds (Pomeroy, in prep.), the density being particularly high in the central part of the city.

In comparison with some other corvids, there is little information available in literature on the biology of the Pied Crow. It is widespread in Africa south of the Sahara except where there is desert or tropical forest (Mackworth-Praed and Grant, 1963). Pied Crows have received the attention of research workers mainly because of their feeding habits. Among the types of food that they are reported to eat are agricultural crops like maize, and young domestic fowls and eggs (Priest, 1936). On occasions, Pied Crows attack lambs and peck them to death, pulling their eyes out (Hey, 1966), a habit reported about other corvids in Britain and Australia (Holyoak, 1968; Rowley, 1969). In addition, Priest (1936) suggested that they eat insects off cattle and wild animals. The period of egg-laying seems to vary from place to place, being in January in Uganda, western Kenya and the Sudan, and in November in eastern Kenya (Mackworth-Praed and Grant, 1963). Nests are usually constructed in the branches of lofty trees (Clancey, 1964; Mackworth-Praed and Grant, 1963) but some nests have been found near the ground (Priest, 1936) and others on telephone poles—a rather unusual site (Clancey, 1964).

This study of the crow populations in and around Kampala was made between July and October 1970. The main areas of study were at Wandegeya, the refuse tips at Kololo and Mengo-Natete, and Makerere.

MATERIAL AND METHODS

(*a*) **Population counts**

Crow counts were made twice a week at the roost at Wandegeya and once a week at the rubbish dumps. The counts were made using a pair of binoculars and a hand tally counter.

The roost at Wandegeya is a small *Eucalyptus* stand of trees planted mainly along roads, occupying about 10 ha. Apart from a large number of crows inhabiting it at night, the roost is used by about 30 Hooded Vultures *Necrosyrtes monachus* about 15 Hadada Ibises *Hagedashia hagedash*, a few Black-and-white Casqued Hornbills *Bycanistes subcylindricus* and a number of bats (Microchiroptera).

In the evening the crows fly to areas surrounding the roost from where they fly singly, in twos or small flocks to the roost. Counting at the roost was timed to start when the number of crows in the neighbouring area was observed to be low, i.e. between 18.45 and 18.55 hrs and usually took about 15 minutes. A path covering the whole roost was devised from which most of the trees occupied by the crows could be observed.

At each tree, I stood directly below the canopy and counted the birds rapidly clockwise round the canopy. *Eucalyptus* trees lend themselves to this kind of counting since they have thinly distributed lanceolate leaves so that birds sitting on branches are distinct when viewed against the sky.

At the refuse tips the weekly count was made once between 09.00 and 10.00 hrs local time, and on a few occasions several times a day.

(*b*) Behavioural studies

Whenever counts were made at the roost and at the rubbish dumps, notes were made about behaviour. In addition, the behaviour of four crows in cages was studied, though not quantitatively. The four birds were caught in a trap similar to the one suggested by Hollom (1950). The crows were later ringed, their white chest and collar dyed pink, and released for observations in the field.

(*c*) Examination and dissection

Twenty-six crows were shot between July and October 1970 near the roost at Wandegeya and two others were shot at the Kololo rubbish dump. Since a large proportion of the population in Kampala may be roosting at Wandegeya, the crows that were obtained from there are likely to be representative of the population around the city. One bird, which probably had been hit by a stone, was obtained from Lugala (west of Kampala). When the birds were received, they were put into a plastic bag and sealed to avoid loss of ectoparasites. The weight of the birds as well as the lengths of the body, wings, wing span, tarsi and tail were recorded. Ectoparasites from the birds were collected and fixed in 70% ethanol. If the birds were not to be dissected immediately, they were stored in a deep-freeze.

On dissection, the major organs—the alimentary tract, trachea, lungs, and liver—and the abdominal and synovial fluid cavities were examined—and any endoparasites found in them were fixed in 70% ethanol. Thin and thick smears of blood from the heart were made on slides and examined for microfilariae and other blood parasites.

Food from the gizzard was put into a petri-dish and washed several times until all digested and crushed floating material was removed. The remaining food was identified as far as possible under a binocular microscope, and the types of food constituting the highest percentage were recorded as the bulk. The types of food occurring in small quantities were also recorded in detail.

The reproductive condition of the birds was assessed from the size of the gonads which were weighed. As there could be a correlation between the reproductive condition of a bird and moulting, the flight feathers of the birds were examined for any signs of moult. A scale, devised by Ashmole (1962) and also used by Ingolfsson (1970), was used to classify these feathers according to their age.

RESULTS

(*a*) Measurements

The major problem in making studies on the Pied Crow in the field (especially on behaviour) is that there is no difference in the plumage of the sexes. Therefore, measurements were made with the object of determining whether there was a size difference between the sexes. The measurements indicated that males are larger than females (Fig. 1 (*a*)) but the difference is too slight to assist identification in the field.

Some of the measurements made are regarded as not being reliable because they are affected by other factors as well as the accuracy of measuring. The wing length is dependent upon the moult stage of the bird. If the distal primaries are young, or old and torn at the ends, the wing length will be shorter than when they are just mature. The total length of the bird and the wing span depend on how hard the wings and the neck respectively are stretched, and it is difficult to standardize the stretch. However, the bill, tail and tarsal lengths, and the weight are regarded as being more reliable than the first three measurements (the tail feathers do not break much at the tips).

If the more reliable of the measurements are pooled, they may be of some use on trapped birds. The pooling has been done by expressing each measurement as a percentage of twice the mean of all the birds that were examined. The mean of these percentages for a single bird is referred to as the size statistic of the bird. This statistic separates the sexes better than any single measurement (Fig. 1(*b*)), although not completely. Crows with a size statistic larger than 50 per cent are likely to be males, while the majority of crows with a size statistic smaller than this are females. The three males that had a size statistic smaller than 50 per cent had testes weighing 0.01g, 0.02g, and 0.03g each, which is at the lower range of weight of testes of males (0.01-0.1g) that were not in reproductive condition. For the only fledgling that was caught (it had difficulty in flying and perching), apparently only the vasa deferentia had developed. The fledgling had a size statistic of 48%, which is not different from those of the three small males in Fig. 1(*b*). It is probable that these small males were sub-adults.

(*b*) Food

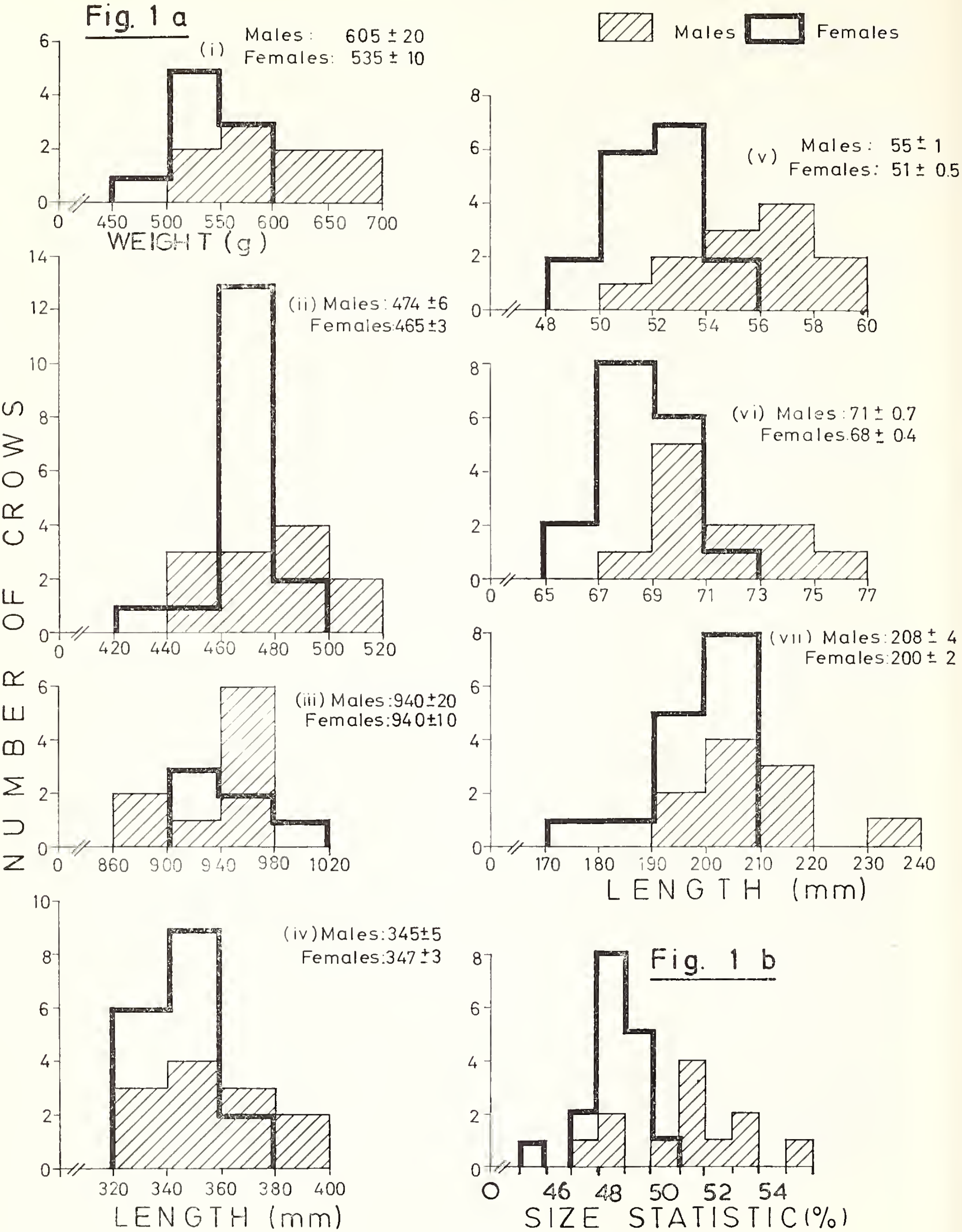
There seems to be a wide variety of types of food eaten by crows (Table 1), which includes plant and animal food and carrion. Some of the material occurring in small quantities, like laterite stones, may be eaten unintentionally in the process of eating other types of food. However, crows have been observed tearing up and eating butter wrappings. Small quantities have been found in their gizzards.

Of the bulk food found in the gizzard, the type that occurred most frequently was groundnuts. Most of these groundnuts were raw but in a few cases they had been roasted. The period of survey was the time when groundnuts were harvested and sold at trading centres. It is likely that the crows obtained them either from the farms around Kampala or from trading centres. The roasted groundnuts may have been obtained from dustbins or from refuse tips.

(*c*) Breeding and moulting

When observations were started in July 1970, there was much twig-carrying activity. This continued to be intense until October. After this period, twig-carrying crows were seen infrequently. The observations were discontinued in January 1971, and there is therefore no information about the intensity of this activity between then and June.

This twig-carrying activity is an indication that the crows are building nests or repairing used ones in preparation for breeding. However, only six nests (four at Makerere, one at Wandegeya and one near the Mengo-Natete refuse tip) were observed



FIGURES

1*a*. The differences in size and weight between male and female Pied Crows: (i) weight, (ii) total length, (iii) wing span, (iv) wing length (v) bill length, (vi) tarsal length and (vii) tail length.

1*b*. A combination of the more reliable measurements—bill, tarsal and tail lengths (Fig. 1*a* v, vi and vii. Also see text).

to be in use. All these nests were high up on lofty *Eucalyptus* trees, constructed in a fork of branches or among many small delicate branches, which made them inaccessible. One of the nests at Makerere disintegrated (apparently after use) and on the ground were many *Eucalyptus* twigs, small bits of cloth and feathers probably used in lining the nest. The rest of the nests, when viewed through binoculars, also seemed to be composed of *Eucalyptus* twigs.

Crows have ten primary and ten secondary remiges (the last 3 or 4 are usually referred to as 'tertials'), and twelve rectrices. Crows examined at the same time were found to be at widely different stages of shedding their flight feathers. Since moulting usually follows breeding, the wide difference in the moult stages of crows at any one time may be a reflection of more or less continuous breeding throughout the year.

TABLE I

Gizzard Contents

Type of Food	*Total no. of crows*	*% of crows with food*	*% of crows having food*	
			As Bulk	*In small quantities*
Vegetable Food				
Groundnuts	6	21	21	0
Potatoes (cooked)	3	10	10	0
Wild dates	4	14	10	3
Cassava (cooked)	2	7	7	0
Maize meal (posho)	3	10	7	3
Maize grains	3	10	3	7
Cabbages	1	3	3	0
Grass blades	7	24	3	21
Flowers (stamens)	2	7	0	7
Rice (cooked)	1	3	0	3
Wild berries	1	3	0	3
Tomatoes	1	3	0	3
Grums	1	3	3	0
Unidentifiable Vegetable matter	3	10	7	3
Animal Food—Prey animals				
Egg shell fragments	8	20	18	10
Green caterpillars	6	21	14	7
Young birds	4	14	3	10
Ants	7	24	3	21
Termites	2	7	3	3
Dipteran Larvae	1	3	3	0
Beetles	1	3	0	3
Animal Carrion				
Fish carrion	4	14	0	14
Meat, small bones	6	21	7	14
Unidentifiable Animal matter	3	10	3	7
Dead Organic or Inorganic Material				
Small stones (Laterite)	3	10	0	10
Small stones (Limestone)	4	14	0	14
Butter wrappings	1	3	0	3
Thin white paper	1	3	0	3
Pieces of wood	1	3	0	3

On the wing, moulting starts from two points—at the base of the wing and at the carpal joint. The moult of the primary remiges starts at the carpal joint and proceeds outwards to the end of the wing. Moulting of the secondary remiges starts at both ends of the secondary remex tract. Therefore, this tract has two moult waves: the proximal one which starts at the base of the wing and proceeds outwards, and the distal one which starts at the carpal joint and proceeds inwards. The two waves converge and meet at the 5th and 6th secondary remiges. The moult of rectrices starts at the centre of the rectrix tract and proceeds outwards. The moulting seems to be synchronous in both wings and on both sides of the tail.

As to the sequence of events during a complete moult of the flight feathers in a crow, it seems that the primary remex moult starts first and ends last, during which period the secondary remiges and rectrices are shed as is true of many passerines. The growth rate of the 9th and 10th primaries, which was measured from captured birds in cages, is about 12 cm per month (Fig. 2). Therefore, it seems that a single long remex (about 16–17 cm from the calamus) takes about 40 days to mature. This figure should be regarded with caution since the growth rate of remiges of birds in the wild could be different from that of cage birds. Nevertheless, from this growth rate and from the size-gradation of growing remiges and rectrices of the birds examined, the period taken for the crows to moult has been estimated.

The moult of primary remiges, which takes the longest time, is completed in about 100 days (just over 3 months) while that of the secondary remiges and the rectrices takes about 50 days (nearly 2 months). This period is short compared with its relative, the Raven, which is 140-150 days (Snow, 1970).

The only crow examined which was in reproductive condition (a male with large testes each weighing ca. 1g) had mature, slightly old flight feathers. In addition, birds examined in August and September 1970 gave a relatively higher moult score than those examined in July and October 1970 (Fig. 3). This suggests that there were relatively more birds with mature flight feathers in these months than in the months before or after it. Since this was the period of marked twig-carrying and nestbuilding activities this indicates that crows may shed flight feathers before or after breeding. In the Raven, wing moult begins at about the same time as the hatching of young (Snow, 1970).

(*d*) **Behaviour**

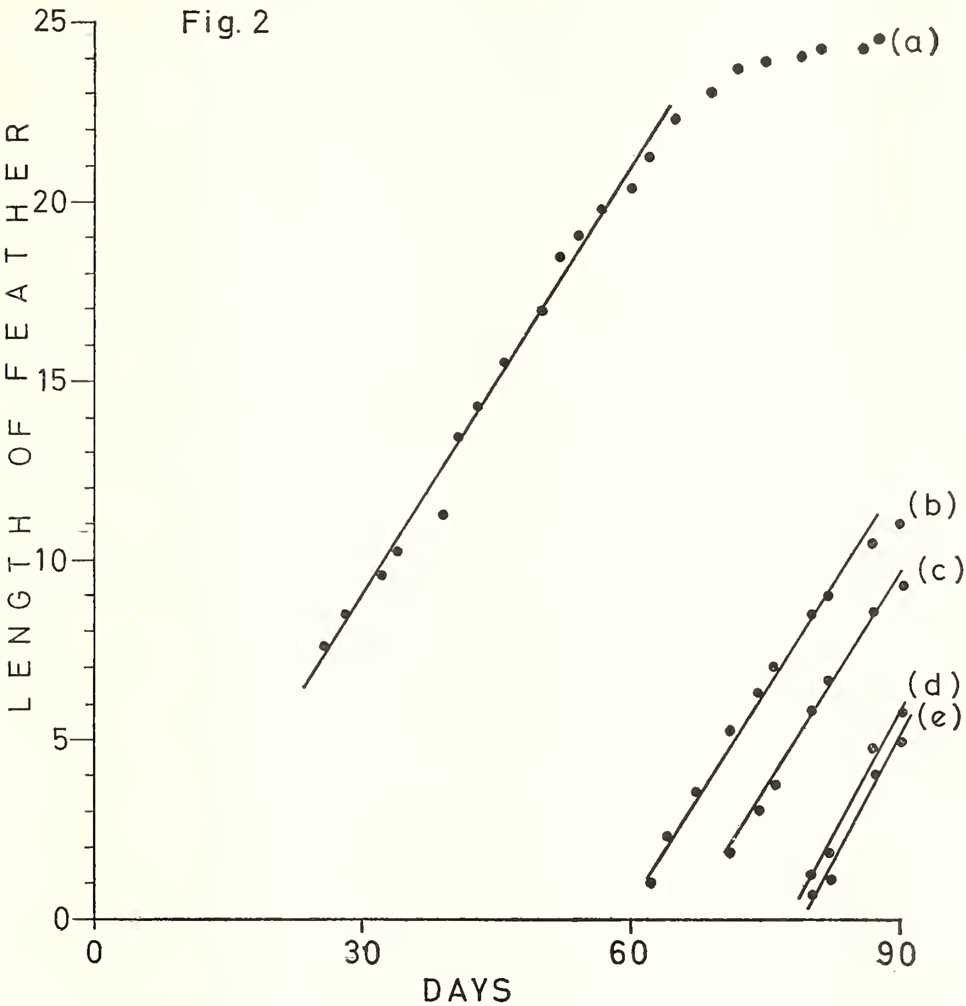
(i) *Pair bond and degree of social behaviour*

Pied Crows are more often seen singly or in pairs than in flocks, which suggests that there is a formation of a pair bond. Sexual display and courtship have been observed between birds of a pair indicating that the pair are a male and a female. During courtship, the male raises the coverts of the chest, neck and head, and elevates its head while facing the female. It then takes a few steps, lowers its head with a fully stretched neck and, with the bill pointing straight at the female, it bends down into a half-crouching position, with the wings lowered, and makes a low but loud "coow, coow" call. Afterwards, the male rises from the half-crouching position, takes a few steps backwards and repeats the same sequence of acts. This performance may be repeated a number of times before the male jumps onto the female to effect copulation, which may be successful if the female does not jump away from its position.

Further, a form of sexual display has been observed at feeding grounds. One of the birds (probably male) stands beside the other (probably female) with its legs wide apart, the head elevated and the coverts of the chest, neck and head feathers raised. It then lowers the head and points the bill directly down between its legs, after which it rapidly tosses the head into the air. This performance is repeated several times rapidly and can be likened to the bird pecking at something between its legs and tossing it into the air. Afterwards, the displaying bird moves closer to the other bird and steps on its leg. On several occasions, the other bird has been observed jumping away a number of times to free its legs. This display was not followed by an attempt by the 'male' to mount the 'female'.

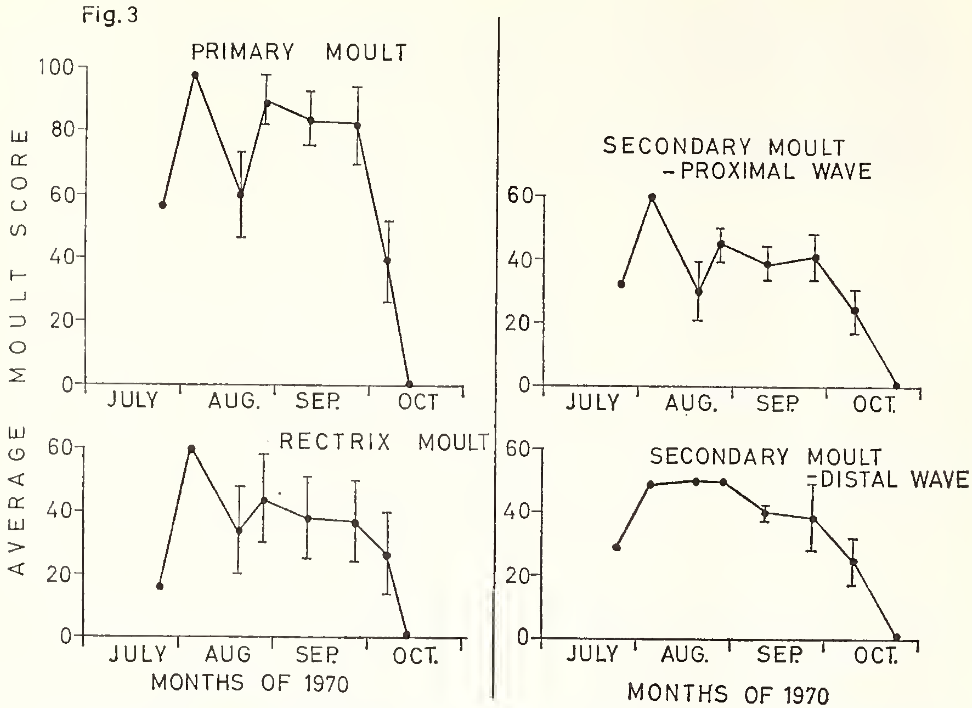
Pied Crows may form flocks which can be as large as forty birds. This occurs especially when they are feeding or soaring, or when returning to the roost. Sometimes, the crows form a large irregular circle while soaring in the evening, displaying what Wynne-Edwards (1962) refers to as "crow's weddings or parliaments". This tendency to social behaviour is also displayed when one of the crows is in trouble; other crows then attempt to come to its aid. Whenever the trap was set and crows were caught, a large number of others gathered around the trap. If I approached, the group of crows outside would start jumping up and down calling excitedly to those crows in the trap.

Fig. 2



The growth of flight feathers of captive Pied Crows (length in millimetres)

First bird: (*a*) left 9th primary remex,
(*b*) right 10th " "
(*c*) left 10th " "
Second bird: (*d*) left 9th " "
(*e*) right 9th " "



3. The means of moult scores of Pied Crows that were examined. Standard deviations are also included where several birds were obtained at the same time.

Eventually, the crows flew away to a distance of about ten metres from where they watched the proceedings. Meanwhile, the birds in the trap were restless, but they did not call even when caught and removed from the trap. When the crows were placed in cages, other crows sometimes gathered around the cages. At times when the ones in the cages were being handled (i.e. being measured, dyed or ringed) those outside would start calling loudly while flying round and round the cages. This sometimes made the captive birds more aggressive, so that they called, clawed and bit viciously.

(ii) *Daily pattern of activities*

As morning approaches, the crows start calling from the roost. Calling starts at about 05.00 hrs, but it is not until 06.00 hrs that they start flying about in the roost. Some start flying away singly, in pairs or in threes, or occasionally in small flocks to neighbouring trees and buildings, or to distant places. About half an hour after the birds start flying, they leave the high buildings and trees, and alight on the ground to start feeding.

Feeding is intensive for the first three to four hours. At each of the rubbish dumps at Kololo and Natete, there can be as many as 30 crows feeding on the refuse. As the sun gets hot, the crows leave exposed feeding grounds and continue feeding in shady areas around homesteads, under trees in compounds, in hedges, plantations and so on. Some rest in trees, making strange sounds, or perform aerial acrobatics or just soar higher and higher in the sky. On cloudy days they stay longer on exposed feeding grounds.

Feeding becomes intensive again in the afternoon and early evening. Around 18.00

hrs, the crows start flying to trees and buildings around the roost, such as Mulago Hospital (about $\frac{1}{2}$ km from the roost) where the number of crows may exceed a hundred. From here they start flying to the roost singly, in pairs or threes, or sometimes in small flocks. Some crows in the roost may fly back to Mulago, so that there is a constant interchange of birds flying to and from the roost. But gradually the numbers around Mulago diminish and by about 19.05 hrs all the crows have left the area for the roost. Counts at the roost showed that there are between 450 and 500 crows inhabiting it at night.

On some evenings, the crows may be restless. They fly from one tree to another causing crows already on it to fly into the air, fly round and come back to the same or another tree, 'cawing' excitedly causing more and more crows to fly into the air, until the flock is large. Sometimes crows on the whole roost get up in this way; they fly in one direction and as they go, groups break off and wheel back to the roost. This causes intense activity and unrest in the roost, with crows coming back and trying to settle down, but being caused to fly away again by other returning crows. This intense activity dies down gradually as it gets dark, and by 19.30 hrs the crows have settled down for the night, although an odd pair can be seen now and then, flying from one part of the roost to another

This calling and flocking together of crows in the roost is similar to what Wynne-Edwards (1962) refers to as epideictic displays, which he suggests are associated with population control measures employed by the species. He is of the opinion that the display enables the crows in the roost to assess the size of the population and thereby get adjusted to a breeding level which will not cause over-crowding.

(iii) *Voice*

The method used to describe sounds made by crows will be that referred to by Hold (1970) as the subjective syllabic method, which, according to him, is still valid in spite of the many developments in the technique for refining bird-song analysis.

The crows make the well-known "caaw", described by Williams (1963) and many others as a harsh guttural call, and described by Clancey (1964) as a simple "kwaak". The "caaw" is varied according to the situation:

(*a*) When crows are at, or near, the nest and a person approaches they make a long rising "caaw" which sounds like a complaining note.
(*b*) When the crows seem to be excited or frightened, the "caaw" is short, repeated many times and more or less just "ca-ca-ca-ca".
(*c*) When a crow is calling its mate, it makes a straight-forward long "caaw, caaw, caaw", repeated usually twice or three times.
(*d*) When feeding or looking for food, the crow may make "caaws" of various kinds.
(*e*) When crows are fighting, they make the sharp "ci-i-i-i" of falling pitch.

In addition, crows make the sound "coow" as has been mentioned above. This sound is probably made by males alone during courtship. Earlier, Priest (1936) noted that this sound is made only during the breeding period or at the peak of breeding. Here, two males have been observed making it during courtship.

On several occasions a distant crow has been heard making the sound "cio, cio", the significance of which has not been discovered.

There are two other distinct sounds whose significance is not known. One of them is the guggling noise "cororororo—carararara" which crows make during the day when they are sitting in the canopy of trees. It could be a sound of satisfaction. However, crows have been seen making this sound when feeding or looking for food. An unsettled juvenile was seen making many variations to the "caaw" call, and at the same time attempting to make the "cororoto-carararara" which resulted in queer noises. Another

sound is the "ce-ce-ce" pause, "ce-ce-ce-ce" pause etc. As the crow makes this noise it half spreads its wings.

Chamberlain, *et al.* (1968) examined the syringeal anatomy of the Common Crow, *Corvus brachyrhynchos*, and found that it has seven muscles, sufficient to give the crows considerable ability to vary their sound. A casual inspection of the syringeal anatomy of the Pied Crow indicates a similarity with that of the Common Crow.

(iv) *Relations with man and other animals*

In their daily foraging activity, crows come into close proximity with human beings. They are seen feeding in markets near fish stands, butcheries and dustins; the people do not seem to molest or to pay particular attention to them. This may be due to people being accustomed to seeing these birds foraging, and the birds becoming conditioned to this apparent harmlessness of man.

On the two occasions that crows were caught in the trap, the crows that gathered around the trap did not attack me when I approached, although they put up a tumult of calls. But the crows in the cages, although they did not attack me, showed some form of threat display, especially after they had been handled. This display was in the form of momentarily raising the feathers of the chest, neck and head. One instance was when two crows were on one perch and one of them displayed in this way. To see how the two birds would behave when faced with a threat from me, I made an attempt to drive them off the perch. I waved my hands in the air which made the bird that had not displayed fly off the perch, but not the one that had displayed. I moved closer to within arm's reach of the perch and extended a twig to push the bird off the perch, but the crow simply bit the twig viciously and did not move. This suggests that the display is some form of threat behaviour.

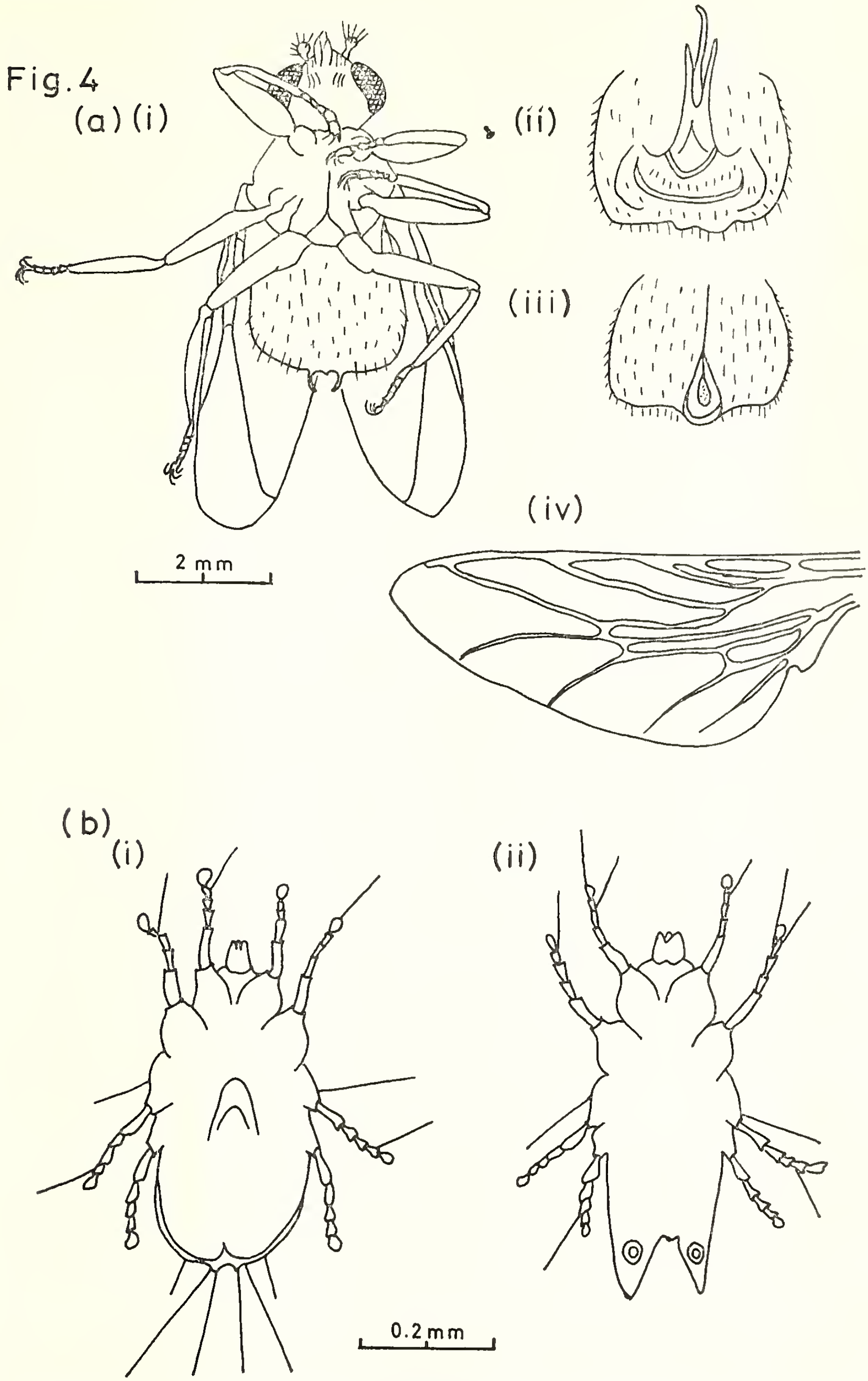
The crows behaved in a variety of ways towards other animals. Whenever a dog passed the cages, crows in the cages would 'caw' and jump up and down. Near refuse tips, crows have been observed to fly round and round a dog, calling and sometimes diving at it. Aggressive behaviour of crows towards dogs may be a result of the competition for food that occurs at the feeding ground, where dogs sometimes chase birds off food. This apparent competition also occurs between birds of different species, i.e. crows, Marabous, kites and vultures. Marabous often drive crows off food by clattering their bills. But kites and crows frequently chase each other for food. Crows and vultures rarely chase each other, probably because vultures do not persist in chasing crows when the latter have got food.

Furthermore, crows perform a type of behaviour, the pulling of tails, the significance of which is yet unknown. One sunny afternoon when a group of Marabous were kneeling and resting after feeding, a crow stealthily walked up behind one of them and pulled its tail until the stork stood up. The crow then trotted to the next stork and repeated the tail-pulling act. The crow performed this act to all the storks in the group, after which it trotted off to feed at the rubbish tip. Crows pull the tails of vultures too and neither species chases the crows after this tail-pulling act. The crows have not been observed pulling the tails of kites which, however, are on the wing most of the time. On one occasion, a crow was observed attempting to pull a cat's tail! (Pomeroy, pers. comm.).

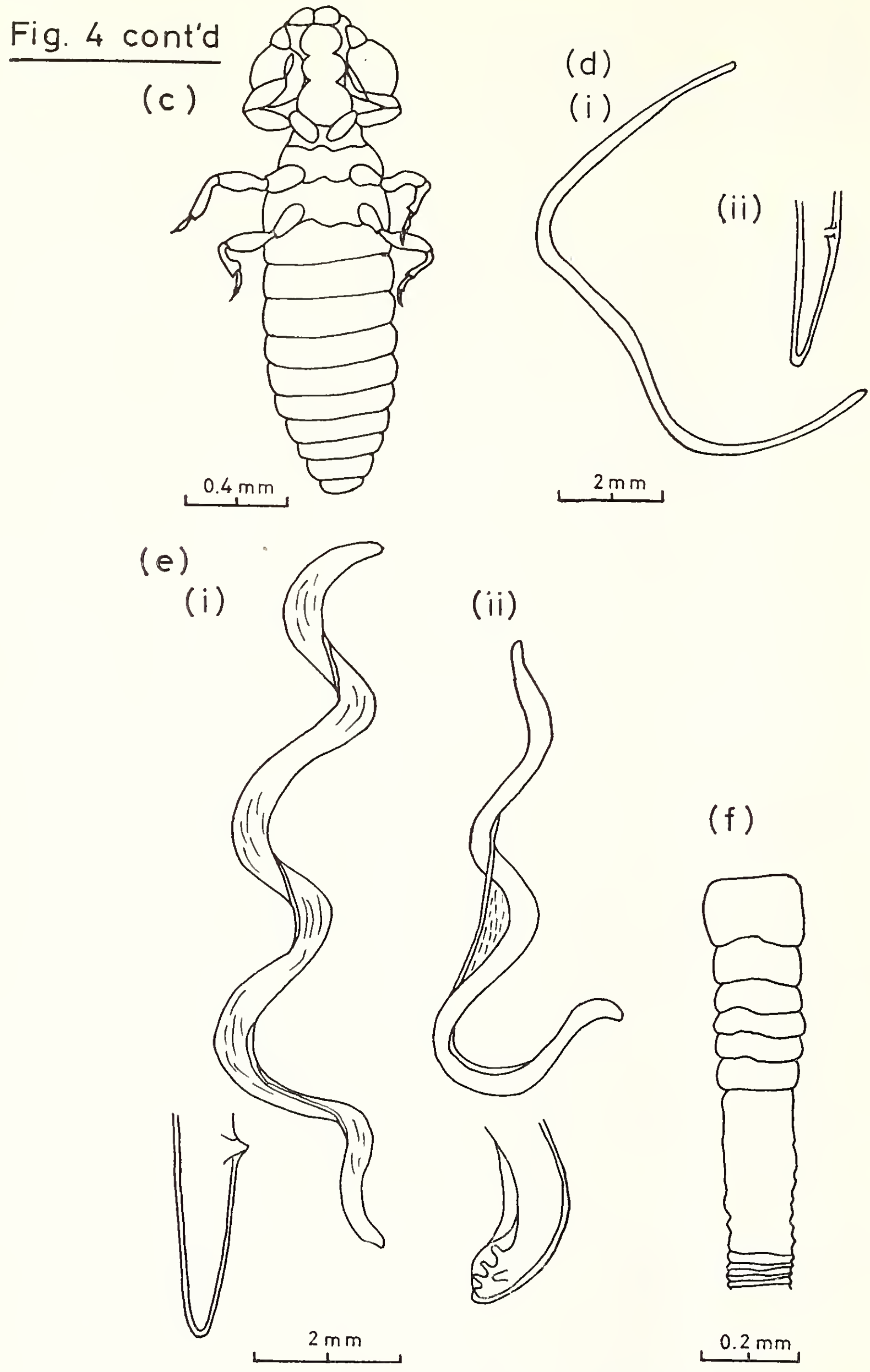
(*e*) **Parasites** (Fig. 4)

Ectoparasites that were found on crows included listerophorid mites, lice (Mallophaga) pupiparan flies and a tick (Table 2). The mites were found lodged in between barbs of the remiges, near the rachis, while the tick was found on the chin. One crow which lacked a lower jaw was highly infested with lice. This high infestation is likely to be a result of the crow being unable to remove the lice by preening. This condition is characteristic of many birds with bill abnormalities (Pomeroy, 1962).

The only endoparasites found in crows were tapeworms (in the small instestine)



Parasites of Pied Crows. (*a*): (i) female Pupiparan fly, (ii) abdomen of male with aedeagus extended, (iii) aedeagus withdrawn, (iv) wing of fly. (b) Listerophorid mites (i) female, (ii) male.



(*c*) Mallophaga. (*d*) nematodes from body cavity (i) whole worm, (ii) hind end. (*e*) Filaroid worms from synovial cavity of tarsometatarsus: (i) female, (ii) male (with insets of hind end). (*f*) scolex of tapeworms.

and nematodes (in the abdominal cavity, and in the synovial fluid cavity of the tibiotarsal joint). The tapeworms are long, measuring about 40 cm. The birds that had nematodes in the synovial fluid cavity, had microfilariae in the blood too, which suggests that these are filaroid nematodes. Their presence in the synovial cavity, was sometimes associated with broken connective tissue which possibly came from the ligamentous aponeurosis.

TABLE 2

Degree of infestation of crows by parasites

Parasite	*No. of infested birds*	*% of infested birds*	*Degree of infestation (No./bird)*
Tt. j. nematodes	9	35	2-51
B.C. nematodes	2	6	1-5
Tapeworms	11	38	1-9
Mites	27	93	Many
Lice	26	90	Usually many
Pupiparan flies	8	28	1-3
Ticks	1	3	1

Total No. of Crows was 29.
Tt. j. = tibiotarsal joint
B.C. = body cavity

DISCUSSION

Although Pied Crows are found in most areas in Uganda, large numbers are found mainly in towns. This is largely a result of the urban areas having plenty of refuse and animal carrion which the birds feed upon. In Kampala, the number of Pied Crows that feed at rubbish tips is only a small proportion (about 1/40th) of the population of crows in the city (Pomeroy, in prep.). The rest are to be found foraging in the densely populated areas of the city. From here, they remove discarded bits and pieces of food, animal carrion and vegetable matter, which would otherwise cause a health hazard to the urban population.

Another beneficial aspect of crows to man is in their catholic feeding habit. Among the many types of food they eat are caterpillars (lepidopteran larvae) some of which could be pests on some agricultural crops, and larvae of dipterans (flies) which could be vectors of human diseases. Therefore, the crows have adapted to living in urban areas not only to their own benefit but also to that of the ever-increasing urban human population.

SUMMARY

The Pied Crow population in and around Kampala was studied and data have been presented on the following aspects: size of crows, food, breeding, moulting, parasites, and behaviour—pair bonding, social behaviour, daily pattern of activities, voice and relations with man and other animals.

ACKNOWLEDGEMENTS

I am grateful to Prof. W. B. Banage, Dept. of Zoology, Makerere University Kampala, for his constant advice and for supervision of this study. Dr. W. R. Wooff (then Director of Tsetse Control Division, Ministry of Animal Industry, Game and Fisheries) rendered a lot of help in obtaining birds for dissection, for which I am thankful.

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THE VASCULAR PLANTS OF MERU NATIONAL PARK, KENYA

Part 1. A preliminary survey of the vegetation

By

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This study was made at the request of Mr Peter Jenkins, Warden of Meru National Park, and has been fully supported by Dr. Perez Olindo, Director of Kenya National Parks. Mr Peter Ordway provided the funds for the major part of the field work. The African Wildlife Leadership Foundation financed a second period of field work and the publication.

My thanks are also due to Dr. P. J. Greenway and Mr J. B. Gillett of the East African Herbarium for their help and encouragement throughout; Mr Gillett has put in a great deal of work on the checklist and visited the camp in Meru National Park for a short period. Miss Kabuye, Botanist-in-Charge of the East African Herbarium, made available drying paper for the specimens and the invaluable services of Mr Frank Magogo, who helped me with most of the collecting and was an excellent field assistant. All the identifications were carried out at the East African Herbarium and I am most grateful to the members of staff involved.

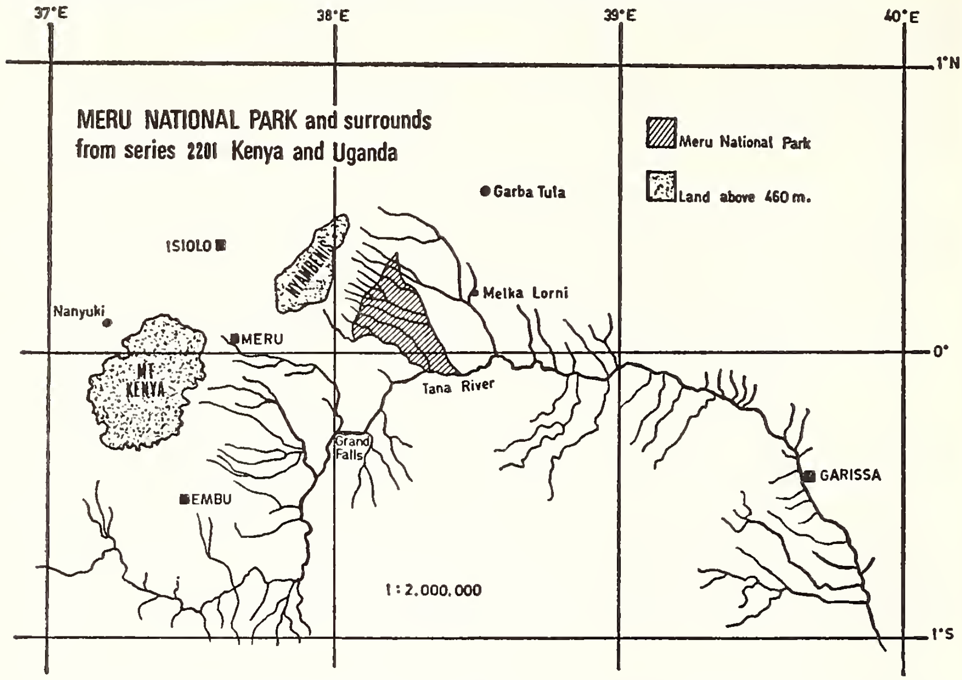
I am also indebted to Mr Edward Potter who did a useful pre-preliminary survey of the park vegetation, and to Mr R. Welch who introduced me to this type of work. I have tried to be influenced as much as possible by Dr. P. J. Greenway's work; I have based my vegetation types on his *A classification of E.A. Rangeland with an appendix on terminology* (D. J. Pratt, P. J. Greenway and M. D. Gwynne—1966).

Drs. P. Cooper and P. Larkin of the National Agricultural Research Station at Kitale were kind enough to arrange for a pasture value analysis of my grass samples, done by Mr A. W. Bristow. I am publishing their results and comments, but unfortunately have not been able to follow this work up with observations of pasture utilization by game animals etc. I hope the results may prove of interest to future workers in the area.

The soil *p*H readings were taken with a soil *p*H kit made available by the Coffee Research Station, Ruiru.

LOCATION AND CLIMATE

Meru National Park lies on the Equator between 0°20′ north and 0°10′ south, 38°0′ and 38°25′ east of Greenwich. The park is roughly triangular (see map 1).



Map 1

The Nyambeni hills, some 10 miles (15.5 km) north-west of the park, rise to 8,000 ft. (2500 m) above sea level (A.S.L.). Along the west boundary of the park the land rises to slightly over 2800 ft. (850 m) A.S.L. and from this point there is a steadily descending gradient across the park from north-west to south-east.

The south-eastern corner, where the Tana River forms the park boundary for about 10 miles (15.5 km), is about 1,000 ft. (300 m) A.S.L. This is the driest and hottest area in the park; the annual rainfall figures follow the altitude gradient across the park and the temperature gradient is inversely proportional to it.

The rainfall at park HQ for the 12 years 1963-1974 is shown in table 1. Noteworthy is the great variability, the maximum annual rainfall being more than four

Table 1
Annual rainfall at Meru Park HQ

Year	*Inches*	*mm*	*Year*	*Inches*	*mm*
1963	33.9	860	1968	52.6	1337
1964	19.6	497	1969	28.9	734
1965	14.1	357	1970	16.2	411
1966	26.1	663	1971	21.4	543
1967	53.6	1362	Average	29.7	754

Addendum
The rainfall at Park HQ for 1972-4 has been as follows

Year	*Inches*	*mm*
1972	21.2	538
1973	11.3	287
1974	21.1	536
av. 1963–1974	28.5 in	724

times as great as the minimum. The average, 724 mm, is probably higher than the true average for a much longer period. The distribution of rain over the year is shown by figure 1, showing that the 'short rains' in November are much more intense than the 'long rains' in March–May. The longest recorded drought is 4.5 months.

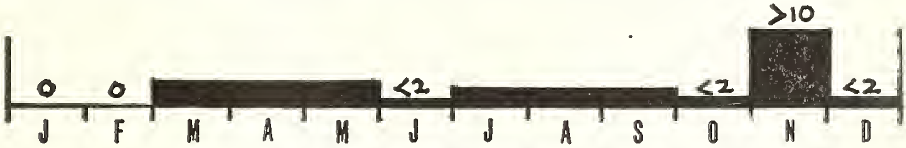
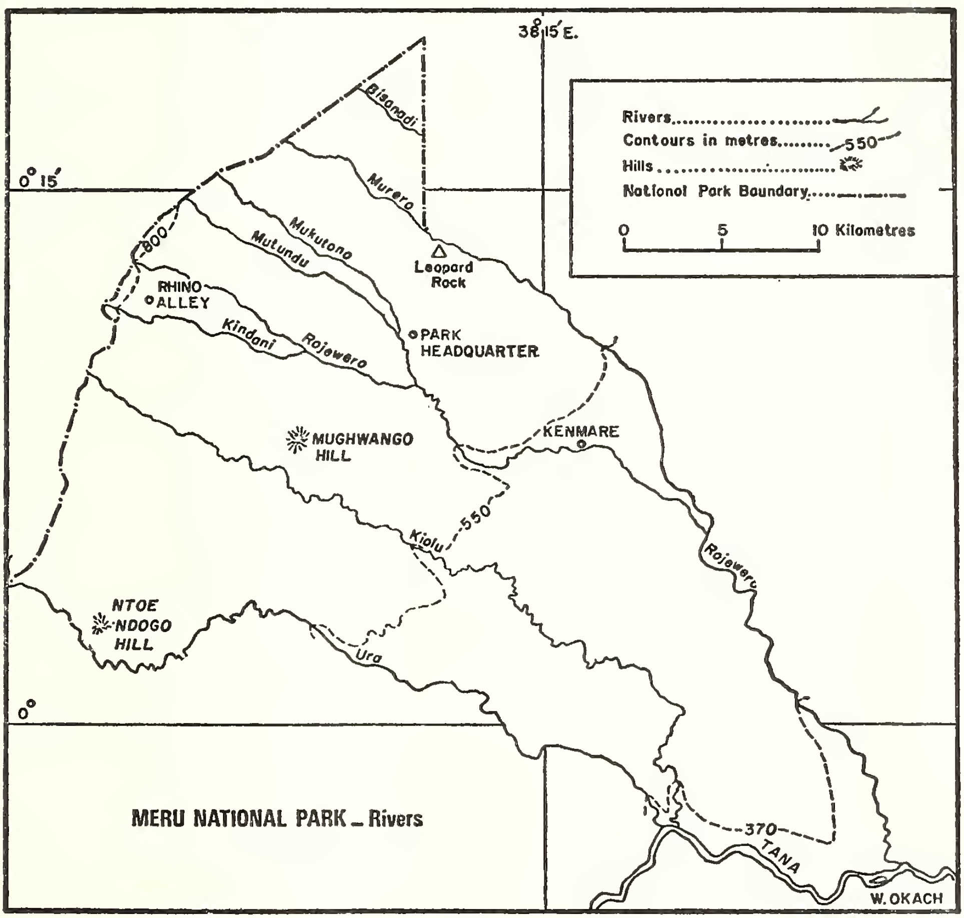


Fig. 1 Rain fall, in inches
0 = Dry Month, 0 rainfall.
2 = Less than 2 (5cms) rainfall.
10 = More than 10 (25cms) rainfall.

The park is well watered by rivers rising in the Nyambenis and flowing across it in a south-easterly direction to join the Tana River (see map 2). Most of those north of the Kiolu River carry water throughout the dry season; the Kiolu and its tributaries dry out, the Ura and Tana rivers providing the only permanent water in the southern section of the park.



Map 2

During the drier months the game collects in the swamps in the northern part of the park, moving to the riverine thicket should the swamps dry out. Shortly after the first rain many of the animals move into the southern section.

In recent years the grasslands have been burnt from time to time. The policy has been to burn early, to prevent hotter more extensive fires later in the dry season. This has probably helped preserve the 'lightly wooded grasslands' in the northern part of the park.

GEOLOGY

Geologically, Meru National Park can be conveniently divided into two sections (see map 3). The northern part of the park is formed of Pleistocene—Recent lava, which flowed from volcanos which formed the Nyambeni ridge. In the southern part of the park the Precambrian rock of the basement system is exposed.

The lava from the Nyambeni volcanic activity flowed along the pre-existing river valleys, blocking the watercourses. This caused the rivers to flow along the parallel edges of the tongue-shaped lava flows, tributaries uniting round the tongue points. This formation can be seen near the north-west boundary of the park, where the Kindani and Rojewero rivers unite.

The lava is chiefly olivine basalt. In the north-west part of the park lava strewn ridges of powdery grey to grey-brown soil slope gently upwards—towards the Nyambenis. In the river valleys are swamps of varying width and the soil is grey to black.

East of the 38°10′ meridian the land flattens somewhat and grey volcanic alluvial soils mark the site of Pleistocene lake beds. The swamps bordering the watercourses are wider and between them are flat areas of powdery grey alkaline soil and low lava strewn ridges.

There is an area of fossiliferous limestone on the banks of the Rojewero River, as it approaches confluence with the Murera (see map 3). This has been formed in the bed of a lake formed when the river was dammed by a lava flow; it post-dates the Nyambeni lava flows. The freshwater Gastropod fossils which have been examined give no indication of the age of the beds, as the forms present were extant over too long a period (Miocene to Recent).

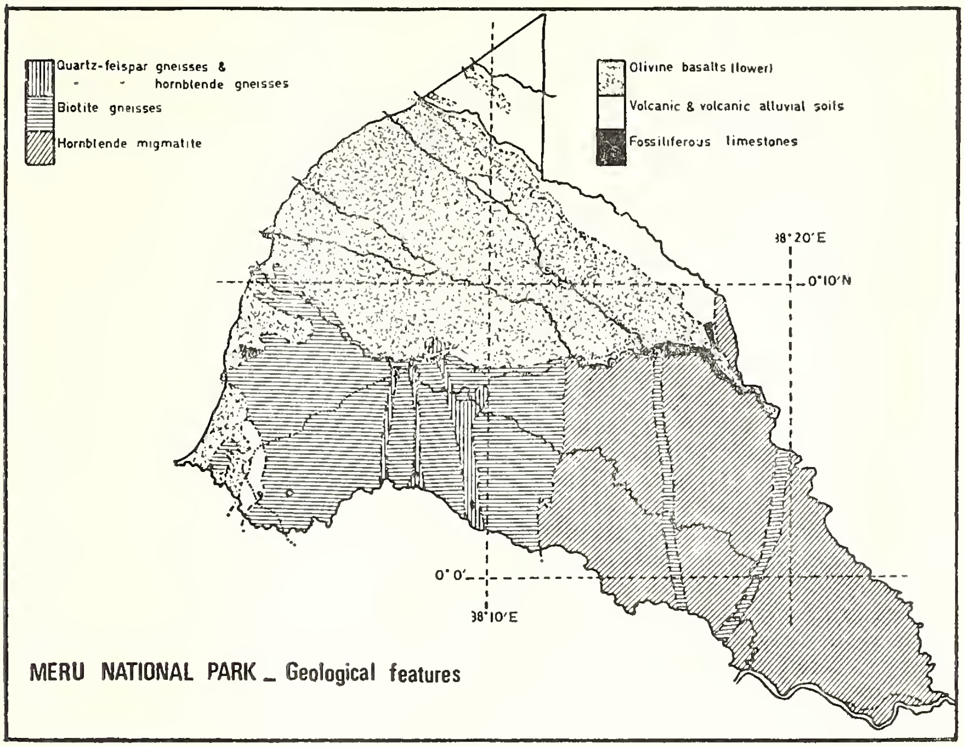
North-east of the Murera River, which forms most of the eastern boundary of the park, red sandy soil covers the basement rocks. A strip of this soil lies inside the park along the south-west bank of the river north of its confluence with the Rojewero.

The southern edge of the Pleistocene lava flows is approximately marked by the courses of the Kiolu and Rojewero rivers. South of these rivers the metamorphic rocks of the basement system are exposed. The area is dissected by incised stream courses and the meandering course of the more mature Kiolu River.

Across the south-west boundary of the park Pleistocene lava flows form ridges between the rivers, and cover the biotite gneiss of the basement system. There is a small area of volcanic alluvial soil stretching from the Ura gate to a point some 10 km due north, and a small lacustrine deposit of fossiliferous limestone near the west boundary (see map 3).

At Ntoe Ndogo the biotite gneiss is exposed and the red soil derived from it covers the area eastwards to the 38°12′ meridian. It is interrupted by several north-south running strips of quartz-felspar hornblende gneiss and from this harder rock are formed the rocky inselbergs which are characteristic of the southern part of the park.

East of the 38°12′ meridian the horneblende migmatite, rather harder than the biotite gneiss, gives a red, shallow, sandy soil.



Map 3

VEGETATION

The vegetation can be divided into three main types, the boundaries of which correspond closely with the geological divisions (see maps 3 and 4).

The section south of the division followed by the west part of the Kiolu River and the east part of the Rojewero River carries *Acacia/Commiphora* bushland wherever the basement rock is exposed. Along the western boundary, and for some distance east into the park north of the Kiolu—Rojewero division, the well drained ridges of slightly acid volcanic soil carry *Combretum* wooded grassland. The north and north-east parts of the park are rather open *Acacia* lightly wooded grassland on alkaline volcanic alluvial soil. In this section there are extensive swamps along the rivers, with a distinct plant community.

Other communities deserving special mention are the riverine thicket, the vegetation of the rocky inselbergs which are a feature of the park, and the patch of ground water forest on a branch of the Rojewero river near the west boundary of the park.

Acacia wooded grassland

This covers the eastern part of the Nyambeni lava flows and the volcanic alluvial soils along the north-eastern boundary of the park. *Acacia tortilis* and *Acacia senegal* are abundant on the low boulder strewn ridges, giving way to *Hyphaene coriacea* in the low swampy areas beside the rivers.

North of the Murera River, near the eastern boundary, the soil is generally red sandy loam, *p*H 6.3-6.9. Coppicing *Acacia senegal* and *Acacia mellifera* grow to c. 3 m with *Balanites aegyptiaca* and a few *Commiphora africana* and *C. campestris*. The grass cover is poor.

Towards the north-west boundary and in the swampy valleys *Hyphaene coriacea* is dominant. *Acacia senegal* and *Acacia tortilis* form tall trees near the rivers, *Phoenix reclinata* forms the main part of the riverine thicket. The soil is grey to black and strongly alkaline. *Chloris gayana* is the dominant grass with *Echinochloa haploclada* forming pure stands in damper places. Towards the boundary are many tall clumps of *Hyparrhenia filipendula* and *Cymbopogon excavatus. Sporobolus spicatus* forms pure stands where the soil is exceptionally alkaline; *Sorghum versicolor* dominates along the north bank of the Murera River.

South of the Murera river the country is more open. The valleys of the Mukutano and Mutundu carry some *Hyphaene coriacea* and there are areas where *Acacia seyal* var. *fistula* is dominant; *Ficus* sp., *Terminalia brownii*, *Lonchocarpus eriocalyx* and *Tamarindus indica* occur as scattered trees. The grass *Chloris gayana* is dominant, with patches of *Echinochloa haploclada*.

The better drained grasslands towards the eastern boundary north of the Rojewero river are lightly wooded with *Acacia senegal* and *Acacia tortilis*, and some nearly pure stands of *Terminalia spinosa; Balanites aegyptiaca* is common. The grasses *Sorghum versicolor* and *Chrysopogon plumulosus* alternate with patches of *Sehima nervosum. Aristida adscensionis* is common where the ground has been disturbed.

Seen from the air, 'fingers' of denser bush seem to be reaching into the lightly wooded grassland of the park, from the Reserve on the east bank of the Murera River. These 'fingers' of bush consist largely of coppicing *Acacia senegal* and *A. mellifera*, *Albizia anthelmintica* and a low bush undercover of *Grewia villosa*, *Bauhinia taitensis* and *Combretum aculeatum*. A strip of red soil runs along the west bank of the Murera river and here the grass cover is poor.

Towards Kenmere and the confluence of the Rojewero and Murera rivers *Commiphora africana*, *C. campestris* and *C. rostrata* appear, with *Boswellia hildebrandtii*. On the limestone area beside the Rojewero River (see map 3) is mixed bush, with *Terminalia orbicularis*, coppicing *Acacia senegal*, *A. mellifera* and *Delonix elata*. No grass is clearly dominant in this area; *Chrysopogon plumulosus* and *Sorghum versicolor* are most common, but many other species occur in scattered clumps.

The Rojewero plains are open grassland with a few stunted *Acacia* sp. and some small *Balanites aegyptiaca*. Pure stands of *Acacia seyal* var. *fistula* occur in the stream beds, which are dry for most of the year. There are several outcrops of basement rock on these plains, each marked by one or more well grown *Melia volkensii* and often some *Sansevieria* sp. The course of the Rojewero River is marked by a strip of rather dense bush containing species more typical of the southern part of the park. A strip of this denser bush also follows the Mukutano River from Park Headquarters, where there are tall *Acacia tortilis*, *Acacia elatior*, *Delonix elata* and *Melia volkensii*, to its confluence with the Rojewero.

Chrysopogon plumulosus and *sehima nervosum* are the most common grasses on the Rojewero plains, with clumps of ubiquitous species such as *Cenchrus ciliaris* and *Chloris virgata*.

Combretum wooded grassland

Combretum apiculatum is dominant throughout the *Combretum* wooded grassland area (see map 4). The soil is generally brown to brownish grey, powdery, with *p*H 5.4-5.7 at the surface, 5.8-6.2 ten inches deep. There are many scattered lava boulders.

Combretum molle and *C. collinum* are both common but neither is abundant. *C. collinum* is represented by the subspecies *binderanum* and *suluense*, the latter being the

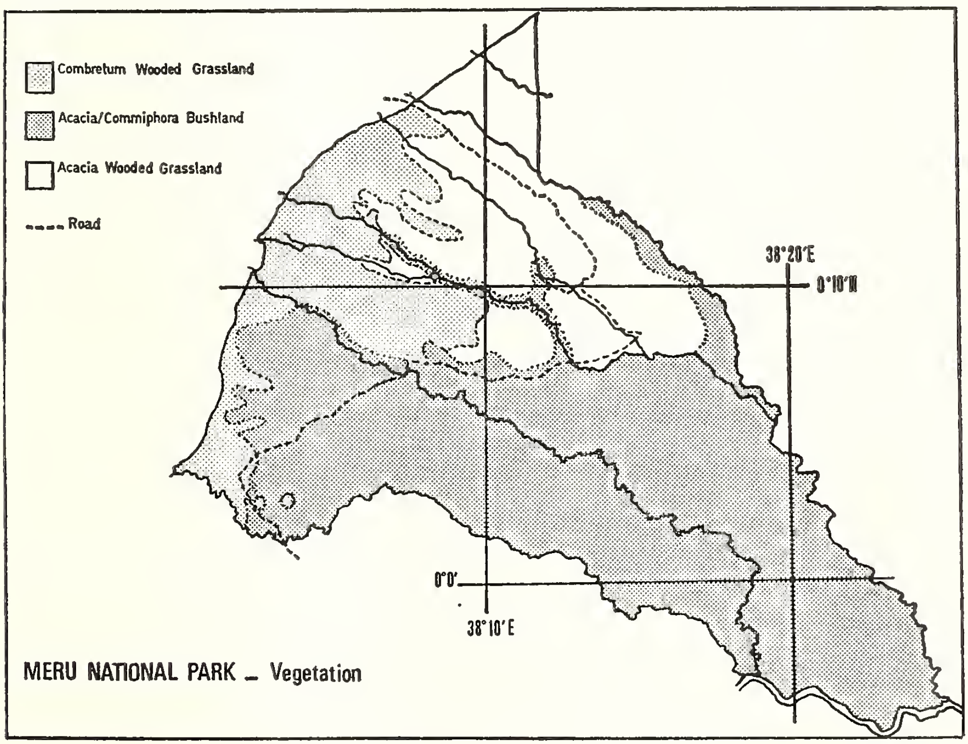
more common near the western boundary. *Ziziphus* sp. and *Harrisonia abyssinica* occur in scattered clumps and *Lawsonia inermis* is common near the rivers. *Commiphora africana* occurs as isolated small trees near the north-western boundary, more abundantly south of the Kiolu River where the *Combretum* wooded grassland and the *Acacia/Commiphora* bushland meet. Other common trees in this part of the park are *Lonchocarpus bussei, Kigelia africana, Lannea stuhlmannii, Heeria reticulata, Acacia nilotica; Ficus sycomorus* occurs near the west boundary and another *Ficus* which was not identified.

Sehima nervosum is the dominant grass throughout most of the *Combretum* wooded grassland, and there are scattered patches of *Chrysopogon plumulosus* and *Aristida adscenionis*, the latter particularly where the land has been recently disturbed.

In the *Combretum* wooded grassland south of the Kiolu River (see map 4) *Sehima nervosum* occurs, but is not clearly dominant. *Sorghum versicolor, Chrysopogon plumulosus* and *Aristida adscensionis* alternate with weedy patches; many of the ubiquitous grasses such as *Rottboellia exaltata, Cenchrus ciliaris* and *Themeda triandra* occur in scattered clumps. There are some swampy patches where *Acacia seyal* var. *fistula* and *Acacia drepanolobium* occur, and the grass *Chloris gayana* dominates.

Along the river valleys near the western boundary the soil is grey to black and alkaline. Here the *Combretum apiculatum* disappears and *Hyphaene coriacea* is dominant, though never very dense. *Piliostigma thonningii* is common at the edges of these swamps. *Chloris gayana* is generally the dominant grass and during the rains petaloid monocotyledons are abundant.

The dominant *Combretum apiculatum* is strikingly taller and more abundant near the western boundary, where the annual rainfall is highest. The Mughwango plains (see map 2) are the most easterly area of *Combretum* wooded grassland, and here the trees are small and widely spaced.



Map 4

Acacia/Commiphora bushland

South of the Kiolu/Rojewero boundary the vegetation is more uniform than in the northern section. The western boundary of this *Acacia/Commiphora* bushland lies just inside the western boundary of the park (see map 4). *Combretum* wooded grassland continues where lava covers the basement rock, but in the river valleys the basement rock is exposed and here species typical of the *Acacia/Commiphora* bushland community appear in the ecotone.

The trees and shrubs are taller and there is better grass cover near the western boundary. This is due to the higher annual rainfall and possibly in part to the deeper sandy soil derived from the biotite gneiss of the basement rock. East of the 38°12′ meridian the rather harder horneblende migmatite weathers to a shallower sandy soil. The soil is red to orange throughout most of the area, *p*H generally 6.3-6.9.

Near the western boundary of the *Acacia/Commiphora* bushland *Acacia mellifera*, *A. nilotica* and the scrambling *A. brevispica* and *A. ataxacantha* are common. Further south-east coppicing *A. senegal* and *A. reficiens* dominate. *Commiphora africana* is most frequent near the western boundary and *Commiphora boiviniana* is common, sometimes growing in a scandent liane-like form. Further east *C. campestris* appears and replaces *C. africana* as the commonest *Commiphora*. In many places there is a dense low bush understorey of *Bauhinia taitensis*, *Grewia villosa*, *Combretum aculeatum* and other species. In this rather dense bush the open spaces are bare of vegetation for most of the year; during the rains various annual grasses and dicotyledons appear.

All the southern section, and particularly the south-eastern part, is much dissected by watercourses. In the hollows where the soil is more alkaline, the *Commiphoras* disappear, leaving the *Acacias* dominant.

Sterculia africana, *Terminalia prunoides* and *Delonix elata* occur as occasional trees throughout the *Acacia/Commiphora* bushland. Towards the eastern boundary *Terminalia orbicularis* is common. Near the western boundary *Terminalia kilimandscharica*, *T. brownii*, *Albizia harveyi* and *A. amara* occur.

The riverine community

The riverine community varies somewhat across the park with the rainfall gradient. The palms *Raphia farinifera* and *Phoenix reclinata* are most abundant near the western boundary. *Ficus sycomorus* and *Newtonia hildebrandtii* are common throughout the park, though less so in the most northerly triangle. *Acacia elatior* is a feature of the permanent rivers and *A. robusta* of the less permanent ones.

The Tana River has its own community; the most striking member is *Populus ilicifolia*, the Tana River poplar, and there are some very large *Ficus* sp. which have not been collected in flower. Further from the water there is a strip of bush dominated by *Salvadora persica*, with much coppicing *Acacia reficiens* and *Maerua denhardtiorum;* this separates the tall riverine trees from the surrounding *Acacia/Commiphora* bushland.

Inselbergs

North of the Kiolu–Rojewero division the lava overlay is deep and the basement rock seldom projects far above it. Mughwango and Leopard Rock are the most striking projections.

On the rocky summit of Mughwango *Xerophyta spekei* is dominant and species such as *Loudetia arundinacea*, *Bulbostylis* sp. (*A & M* 273) and *Mariscus* sp. (=*Napper* 1617) grow in and around the pools, which last only throughout the rains. On the steep rocky sides *Euphorbia nyikae* and *E. candelabrum* are abundant; lower on the slopes *Albizia tanganyicensis* ssp. *adamsoniorum* and *Sterculia africana* are common, with shrubs typical of the *Acacia/Commiphora* bushland community.

The low outcrops on the Rojewero plains are usually marked by *Melia volkensii.*

Between the rivers Kindani and Rojewero near the west boundary of the park is a patch of very dense bush, known as 'Rhino Alley', surrounded by *Combretum* wooded grassland. This is a rather large outcrop of basement rock, and species typical of the *Acacia/Commiphora* bushland are common, though their relative abundance is atypical due to the much higher rainfall in this part of the park.

Groundwater forest

In the same area, on the banks of one of the branches of the Rojewero, is a small area of tall groundwater forest. Trees such as *Blighia unijugata*, *Cordia africana* and *Diospyros mespiliformis* grow to c. 100 ft. (30 m), and lianes such as *Hippocratea* sp. are common. The forest floor is deep leaf litter. This small area of forest seems to have an associated bird, insect and arachnid community distinct from the rest of the park and further study of it would be rewarding.

Swamps

Hyphaene coriacea dominates the swamps, and is particularly abundant in the most northerly triangle, in the swamps of the Bisanadi and Murera rivers. *Piliostigma thonningi* is common at the margin of swamps in the *Combretum* wooded grassland area (see map 4).

The grass *Chloris gayana* is generally dominant, and *Echinochloa haploclada* is abundant. Where there is shade *Panicum maximum*, *P. coloratum* and *Eragrostis superba* form tall clumps. Sedges such as *Fuirena pubescens*, *Pycreus unioloides* and *Fimbristylis* sp. (A & M 12) grow thickly around the standing water, with *Cyperus undulatus*, *C. alternifolius* and *C. laevigatus* in the water.

PASTURE VALUE ANALYSIS

The seven species of grass listed in table 2 were collected in bulk, dried, and sent to the laboratories of the National Agricultural Research Station at Kitale. These species were chosen because each seemed sufficiently abundant to provide an appreciable pasture.

Table 2

	1	2	3	4	5	6	7	8	9
Sample	%N	%P	%K	%D	% N.D.F	% A.D.F.	% A.D.L.	% N.D. ash	% Crude protein
Aristida adscensionis	0.89	0.17	0.55	41.0	79.81	50.55	6.23	2.32	5.56
Chloris gayana	0.73	0.30	1.08	42.4	75.57	52.18	7.00	2.25	4.56
Eragrostis superba	1.15	0.23	0.75	37.0	81.40	52.08	8.48	1.76	7.19
Sehima nervosum	0.68	0.12	0.55	39.0	75.62	54.78	5.90	4.84	4.25
Heteropogon contortus	0.61	0.09	0.47	37.8	77.47	49.02	6.08	2.11	3.81
Sorghum versicolor	0.66	0.24	0.82	38.8	72.63	47.95	5.78	3.58	4.13
Chrysopogon plumulosus	0.89	0.20	0.42	37.8	7.49	49.77	7.31	3.30	5.56

Chloris gayana, considered the most useful pasture grass for domestic stock of those analysed, is dominant over most of the swamps where the game congregates during the dry season.

Notes from Dr. P. Larkin and Mr A. W. Bristow (private communications) referring to table 2:

(*a*) Column 4, per cent D, the per cent in vitro digestibility, an estimate of the nutritive value to ruminants.
(*b*) Column 5, per cent N.D.F., per cent neutral detergent fibre, on estimate of the cell wall content.
(*c*) Column 6, per cent A.D.F., per cent acid detergent fibre, cellulose + lignin + cutin + silica.
(*d*) Column 7, per cent A.D.L., per cent acid detergent lignin, lignin + cutin.
(*e*) Column 8, per cent N.D. ash, ash soluble in neutral detergent, silica.
(*f*) The difference between neutral detergent fibre and acid detergent fibre is an estimate of the hemicellulose, although this difference does include some protein attached to cell walls.

A. W. Bristow.

(*g*) Column 9, crude protein values obtained by multiplying the per cent N figures by 6.25.
(*h*) The 'D' value is something developed at Hurley as a quality estimation. Strictly it is "percentage Digestible Organic Matter in the Dry matter of the feed"—D.O.M.D. Our figures here indicate that with good pasture management, with cutting intervals of four weeks, it is possible to maintain a *Chloris* (*gayana*) sward at 60D for the majority of the wet season. A D value of 63 is considered the aim in U.K. for good productivity, and about 50D is reckoned to be maintenance level for European stock; but that is for consumed, not available forage and there is obviously likely to be considerable selection. This is what all the fistulation work is about.

Dr. Peter Larkin.

Part 2. Checklist of the vascular plants recorded

By

J. G. Ament and J. B. Gillett[1]

This list records probably no more than 80-90 per cent of the species of vascular plants which actually occur in the park. The area was till recently very inaccessible. So far as is known Mrs Joy Adamson and her brother-in-law Mr Terence Adamson in 1955 or thereabouts, were the first people to collect plants in the area which, largely through the efforts of Mrs Adamson and her husband, subsequently became the park. All collections except those of Mrs Ament and Mr F. C. Magogo have been made sporadically on brief visits to the park.

The sequence and numbering of families is that of the late J. Hutchinson F.R.S. in his *Families of Flowering Plants* ed. 1 (1926 and 1934). This is the sequence used in *The Flora of West Tropical Africa*, *The Flowering Plants of the Sudan* and in the East African Herbarium.

An asterisk (*) before a name indicates that the species is of especial interest because it seems to be new, is rare in Kenya, or here reaches the limit of its range. For instance *Albizia tanganyicensis* was unknown in Kenya before 1965 and is represented in this country by the recently described subspecies *adamsoniorum* which has been found only once outside Meru National Park. *Kirkia tenuifolia* seems here to reach the southern limit of its range.

The letters F.T.E.A. followed by a year after the name of a family indicate that it has been described in the *Flora of Tropical East Africa*, published in that year. It will be appreciated that names in these families are usually more reliable than those in families which have not yet been revised for this flora.

The letters and figures at the right of each entry indicate (except for sight records) one or more specimens preserved in the East African Herbarium by reference to which the name can be checked. The letters except for the abbreviations *s.n.* (*sine numero*—without a number) and s.r. (sight record) indicate the names of collectors, as follows:

A	=	J. G. Ament
A & M	=	J. G. Ament and F. C. Magogo
EP	=	E. Potter, specimens not preserved
F	=	F. R. Fosberg
G	=	J. B. Gillett
G & A	=	J. B. Gillett and J. G. Ament
HS	=	S. Heriz-Smith
JA	=	Joy Adamson
M & F	=	O. M. Mwangangi and F. R. Fosberg
O	=	R. M. Osborn
PA	=	P. G. Archer
R	=	S. A. Robertson
SM	=	Simon Mathenge
TA	=	Terence Adamson
V	=	B. Verdcourt

The following abbreviations are used in the second line of each entry where it seems useful in describing the habitat of each species. Where the line is not crowded the words are written in full.

A/C.B. = *Acacia/Commiphora* bushland
A.W.G. = *Acacia* wooded grassland
C.W.G. = *Combretum* wooded grassland
G.W.F. = Ground water forest

1. E. A. Herbarium, E. A. A. F. R. O., Box 45166, Nairobi, Kenya.

ACKNOWLEDGEMENTS

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PTERIDOPHYTA

Actiniopteris radiata (Sw.) Link — R 2121
Small herb in rock crevices in A/C.B., occasional
Pellaea spp. are to be expected in the west of the park

DICOTYLEDONS : ARCHICHLAMYDEAE

11. Lauraceae

Cassytha filiformis L. — A & M 283
Climbing parasitic herb in *Acacia* wooded grassland; uncommon

24. Aristolochiaceae

**Aristolochia petersiana* Kl. — JA 592
Twiner by river, poisonous, uncommon

34. Turneraceae F.T.E.A. (1954)

Streptopetalum hildebrandtii Urb. — G 18884; A & M 237
Herb, 20 cm, scattered throughout *Combretum* W.G.

36. Capparaceae (Capparidaceae) F.T.E.A. (1964)

Boscia angustifolia A. Rich. var. *angustifolia* — A & M 113
Tree, 8 m, riverine and throughout A/C. bushland, common
B. coriacea Pax
Shrub, *Acacia/Commiphora* Bushland, common
B. mossambicensis Kl. — A & M 28
Shrub, *Acacia/Commiphora* bushland, common
Cleome brachycarpa DC. — A & M 413
Herb, 0.5 m, A.W.G.-A/C.B. ecotone, occasional
C. hirta (Kl.) Oliv. — A & M 95
Herb to 1.5 m, *Combretum* W. G. and *Acacia* W. G., common
C. monophylla L. — A & M 123
Annual herb to 0.5 m., common in regenerating clearings
Gynandropsis gynandra (L.) Briq. — A & M 125
Herb, 1 m, common weed of cleared ground
Maerua angolensis DC. — EP
Small tree in *Combretum* W.G., occasional
**M. denhardtiorum* Gilg — A & M 417
Shrub to 1.5 m, common near Tana River
M. edulis (Gilg & Ben.) De Wolf — G 16986
Softly woody shrub 2 m, Tana R. bank, locally frequent
M. kirkii (Oliv.) F. White — M & F 653; A & M 389
Shrub, 2 m, riverine thicket in A/C. bushland, common
M. subcordata (Gilg) De Wolf — SM 106; A & M 146
Scrambling shrub, *Acacia/Commiphora* bushland, uncommon

39. Cruciferae (Brassicaceae)

Farsetia stenoptera Hochst. — JA 593
Herb, 20 cm, near Rojewero R., occasional

40. Violaceae

Hybanthus dangueyanus H. Perr. — A & M 278
Shrub, 1 m, shaded slopes of inselberg, occasional
H. enneaspermus (L.) F. V. Muell. — A & M 261
Herb to 0.5 m, near rivers in *Acacia/Commiphora* bushland

42. Polygalaceae

Polygala kilimanjarica Chod. — A & M 101, 296
Herb, 1.5 m, C.W.G. and on river banks along N.W. boundary of park, occasional
P. liniflora Chod. — A & M 246, 274
Herb, 30 cm, C.W.G. and on rocky ridges, occasional

P. sp. near *liniflora*	SM 93
Herb, 40 cm, A.W.G. in N.E. of Park, occasional	
P. sp.	G 18885
Herb, 25 cm, C.W.G. in S.W. of Park, occasional	

45. Crassulaceae

Kalanchoe lanceolata (Forsk.) Pers.	A & M 247
Succulent, outcrops of basement rock in A/C.B.-C.W.G. ecotone, occasional	

54. Aizoaceae F.T.E.A. (1961)

Gisekia pharnaceoides L. var. *pharnaceoides*	A & M 295
Low, spreading herb, C.W.G., common near west boundary	
Glinus lotoides L.	A & M 9
Low spreading herb, A.W.G., common at swamp margins	
Mollugo nudicaulis Lam.	A & M 133, 297
Herb, 20 cm, C.W.G., common near west boundary	

56. Portulacaceae

Portulaca foliosa Ker Gawl.	A & M 264
Succulent, 20 cm, rocky places in A/C bushland, common	
P. oleracea L.	R 2109
Prostrate fleshy herb on black cotton soil in C.W.G., occasional	
Talinum portulacifolium (Forsk.) Schweinf.	R 2110
Fleshy herb 1 m tall on sand in A/C bushland, occasional	

57. Polygonaceae F.T.E.A. (1958)

Oxygonum sinuatum (Meisn.) Dammer	A & M 128
Herb, 0.5 m, C.W.G., common weed of cleared ground	
O. stuhlmannii Dammer	A & M 150
Herb, 20 cm., rocky outcrops, uncommon	
**O.* sp. new?	G 17003, 18925
Herb, 30 m, open spots in A/C.B., S.E. corner of Park, locally frequent	

63. Amaranthaceae

Aerva persica (Burm.f.) Merr.	SM 8; A 539
Herb, 1 m, *Acacia* W.G. & A/C bushland, common	
Amaranthus graecizans L.	R 2117
Weed near buildings, frequent	
Celosia schweinfurthiana Schinz	A 531
Herb, 1 m, *Acacia/Commiphora* bushland, common	
Cyathula orthacantha (Asch.) Schinz	A & M 401
Herb, 1.5 m, *Acacia/Commiphora* bushland, common near water	
Digera muricata (L.) Mast.	G 20130; A 484
Herb, 1.5 m, common on disturbed land	
Psilotrichum elliotii Bak.	A & M 156, 178
Shrub, 1.5m, *Acacia/Commiphora* bushland, common	
Sericocomopsis pallida (S. Moore) Schinz	SM 53
Softly woody shrub, 0.5-1.5 m, in A.W.G. & A/C.B. at eastern edge of park, occasional	

66. Zygophyllaceae

Tribulus cistoides L.	A & M 192
Herb, 25 cm, *Acacia/Commiphora* bushland, common	

67. Geraniaceae F.T.E.A. (1971)

Monsonia senegalensis Guill. & Perr.	G 20125
Herb, 20 cm, *Acacia/Commiphora* bushland, occasional	

72. Lythraceae

Ammannia baccifera L.	G 20149
Annual herb, 15 cm, by rainwater pool in rocky river bed, occasional	
Lawsonia inermis L.	A & M 29, 61
Shrub, 4 m, A.W.G. and C.W.G., common	

83. Nyctaginaceae

Boerhavia coccinea Mill.	A & M 294
Herb, 25 cm, *Combretum* wooded grassland, common	
B. erecta L.	G 20140
Herb, 1 m, beneath *Acacia* near river, locally common	

Commicarpus plumbagineus (Cav.) Standl.	SM 23
Herb in *Acacia* wooded grassland, occasional	
C. stellatus (Wight) Berhaut	R 2111
Straggling herb in A/C bushland, occasional	

93. Flacourtiaceae

Oncoba spinosa Forsk.	A & M 73
Scrambling shrub, riverine, common	

101. Passifloraceae

Basananthe hanningtoniana (Mast.) De Wilde	G 17016; A 475
Climbing herb, riverine, uncommon	

103. Cucurbitaceae F.T.E.A. (1967)

Coccinia grandis (L.) Voigt	G 20136
Climbing herb, riverine, occasional	
Cucumis hirsutus Sond.	A & M 293
Herb, 0.5 m, *Combretum* wooded grassland, common	
Kedrostis foetidissima (Jacq.) Cogn.	SM 162
Climbing herb, near river, occasional	
K. gijef (J. F. Gmel.) C. Jeffr.	SM 65; A & M 342
Climbing herb, *Acacia/Commiphora* bushland, uncommon	
Zehneria scabra (L.f.) Sond.	SM 35
Climbing herb, near stream, occasional	

114. Ochnaceae

Ochna, ? O. ovata F. Hoffm.	A 536
Shrub, 2-3 m, occasional	

121. Combretaceae F.T.E.A. (1973)

Combretum aculeatum Vent.	A & M 51, 70; A 542
Scrambling shrub, ubiquitous, common	
C. apiculatum Sond.	A & M 60, 81
Tree, 7 m, dominant throughout *Combretum* wooded grasaland	
C. collinum Fres. ssp. *binderanum* (Kotschy) Okafor	A & M 309
Tree, 10 m, *Combretum* wooded grassland, common	
C. collinum Fres. ssp. *suluense* (Engl. & Diels) Okafor	A & M 16, 79
Tree, 10m, *Combretum* wooded grassland, common	
C. hereroense Schinz var. *parvifolium* (Engl.) Wickens	A & M 235
Shrub, 3 m, ubiquitous	
C. molle G. Don	A & M 59
Tree, 10 m, scattered throughout *Combretum* wooded grassland	
C. mossambicense (Kl.) Engl.	A & M 80, 89
Scandent shrub, *Combretum* W. G., common near west boundary	
Terminalia brownii Fres.	A & M 19, 48
Tree, 10 m, *Combretum* W. G. and *Acacia/Commiphora* B., common	
T. kilimandscharica Engl.	A & M 162
Tree, 20 m, *Combretum* wooded grassland, uncommon	
T. orbicularis Engl. & Diels	A & M 291
Sprawling shrub or small trees, A/C.B., occasional	
T. prunioides Laws.	A & M 319
Tree, 15 m, ubiquitous	
T. spinosa Engl.	A & M 152
Tree, 15 m, *Acacia* W. G. and *Combretum* W. G., common	
SM 58 and A 541 may represent a pubescent juvenile state or something new.	

122. Rhizophoraceae F.T.E.A. (1956)

**Cassipourea* sp. aff. *C. celastroides* Alston & *C. euryoides* Alston	A & M 279
Tree, 7 m, rocky inselbergs, uncommon	

126. Guttiferae (Clusiaceae)

Garcinia livingstonei T. And.	A 560
Tree, 10 m, riverine, ubiquitous	

128. Tiliaceae

Corchorus olitorius L.	G 20122; A 472
Herb, 1 m, common at margins of swamps	

C. tridens L. Small herb, 20 cm, C.W.G., S.W. corner of park, occasional	G 18883
C. trilocularis L. Herb, 50 cm, common in damp places	G 18886; A & M 315
Grewia bicolor Juss. Shrub, 2 m, common in riverine thicket & A/C. Bushland	A & M 346
G. lilacina K. Sch. Shrub, 2 m, *Acacia/Commiphora* bushland, common	A & M 214
G. tembensis Fres. var. *kakothamnos* Burret Shrub, 2 m, *Acacia/Commiphora* bushland, common	A & M 144, 164
G. tenax (Forsk.) Fiori Shrub, 2 m, *Acacia* wooded grassland & A/C.B., common	A & M 334
G. villosa Willd. Shrub, 1.5 m, *Combretum* W.G. and A/C. bushland, common	A & M 176, 312
Triumfetta flavescens A. Rich. Woody herb, 1-1.5 m, A.W.G. & C.W.G., locally abundant	A & M 172; M & F 618
**T.* sp. aff. *heterocarpa* Sprague & Hutch. Woody herb, 1 m, A/C. bushland in S.E. of park, locally common	G 18913; SM 25

130. Sterculiaceae

Hermannia exappendiculata (Mast.) K. Sch. Herb, 25 cm, *Acacia/Commiphora* bushland, uncommon	A & M 361
H. kirkii Mast. Herb, 1 m, banks of Tana R. in S.E. of park, occasional	G 16989
Melhania ovata (Cav.) Spreng. Herb, 25 cm, C.W.G. & A/C.B. common	G 20145; R 2113
M. velutina Forsk. Herb, 30 cm, *Combretum* wooded grassland, occasional	A & M 97
Sterculia africana (Lour.) Fiori Tree, 10 m, A/C.B. and basement rock outcrops in C.W.G., frequent	A & M 148, 179
S. stenocarpa H. Winkl. Small tree, *Acacia/Commiphora* bushland	EP
Waltheria indica L. Herb, 1 m, *Acacia/Commiphora* bushland, common	A & M 151

131. Bombacaceae

Adansonia digitata L. Tree, with greatly swollen bole, 20 m, widespread, occasional	A & M 281

132. Malvaceae

Abutilon fruticosum Guill. & Perr. Herb, 0.5 m, *Combretum* wooded grassland near rivers, common	SM 109, 129; A & M 314
A. sp. Herb, 1 m, *Combretum* wooded grassland near rivers, common	A & M 135
**Gossypium somalense* (Guerke) J. B. Hutch. Herb, 1.5 m, A.W.G.-A/C.B. ecotone, occasional	JA in EA13542; M & F 620
Hibiscus calyphyllus Cav. Herb, 1.5 m., riverine, common	A & M 313
H. cannabinus L. Herb, 1.5 m, riverine, common	A & M 41
H. sp. perhaps *H. meeusei* Exell Herb, 1.5 m, common at swamp margins	A 471
H. micranthus L.f. Herb, 25 cm, *Acacia/Commiphora* bushland, common	A & M 143, 268
H. panduriformis Burm.f. Herb, 1 m, swamps, uncommon	A & M 6
H. vitifolius L. s. lat. Herb, 1-1.5 m, *Combretum* wooded grassland, occasional	R 1805
H. sp. Herb, 0.5 m, *Combretum* wooded grassland near water, common	A & M 393
H. sp. Herb, 1 m, riverine in west of park, occasional	G & A 20160/A
Pavonia arabica Boiss. Herb, 1 m, *Acacia* wooded grassland, common	A 548
P. patens (Andr.) Chiov. Herb, 0.5 m, *Acacia/Commiphora* bushland, common	A & M 189
P. zeylonica Cav. Herb, 0.5 m, *Acacia/Commiphora* bushland, common	A & M 187

P. sp. = G 16464 — A & M 412
Herb, 0.5 m, A/C. bushland—A.W.G. ecotone, uncommon
Sida ovata Forsk. — G 20144
Herb, 30 cm, *Acacia/Commiphora* bushland, frequent

133. **Malpighiaceae** F.T.E.A. 1968

Triaspis niedenzuiana Engl. — A & M 335
Shrub, 1 m, *Acacia* wooded grassland, uncommon

135. **Erythroxylaceae**

Erythroxylum fischeri Engl. — TA 10; A & M 212
Shrub, 2 m, in groundwater forest on Rojewero River, local

136. **Euphorbiaceae**

Acalypha ciliata Forsk. — G 20135
Herb, 20 cm, beneath *Acacia* by river in A/C.B., locally common
A. fruticosa Forsk. var. *fruticosa* — A & M 114
Shrub, riverine, common in A/C.B.—C.W.G. ecotone
A. indica L. — M & F 632, 660
Annual herb near rivers in A/C. Bushland, frequent
A. racemosa Baill. — A & M 306
Herb, 75 cm, riverine in *Combretum* W.G., common
**Argomuellera macrophylla* Pax — A & M 170
Shrub, 3 m, groundwater forest on Rojewero River, local
Bridelia taitensis Pax & Vatke — A & M 21, A 511
Spreading shrub, 2-3 m, common near western park boundary
Cephalocroton cordofanus Hochst. — F & M 49936
Shrublet in *Acacia* wooded grassland, occasional
Dalechampia scandens L. var. *cordofana* Muell. Arg. — A & M 133, 304
Twining herb, 25 cm, *Combretum* wooded grassland, riverine, occasional
Euphorbia candelabrum Kotschy — A 566
Succulent tree, 10 m, common on basement rock
E. cuneata Vahl — M & F 641; G 16990
Shrub, 2-3 m, *Acacia/Commiphora* bushland, locally frequent
E. hypericifolia L. — A & M 106
Herb, 25 cm, riverine, uncommon
E. inaequilatera Sond. — G 18890
Herb, 40 cm, *Combretum* W. G. in S.W. of park, occasional
E. jatrophoides Pax — G 18911; A & M 382, 385
Shrub, 2 m, *Acacia/Commiphora* bushland, common
E. nyikae Pax var. *kibweziensis* (N.E. Br.)— — G 16993
Succulent tree, 7 m, rocky slopes in A/C.B. in S.E. of park, occasional
E. polyantha Pax — A & M 277
Shrub, 1.5 m, rocky inselbergs, common
E. pseudograntii Pax — A & M 138
Shrub or tree, 5 m, rocky inselbergs in A/C.B., common
E. rivae Pax — A & M 245
Herb, 25 cm, *Combretum* W. G., common near water
E. robecchii Pax — EP
Tree, 10-15 m, Acacia/Commiphora bushland, occasional
E. tirucalli L. — R 2106
Shrub to 5 m, south-west of park, probably introduced
**Jatropha fissispina* Pax — G 18902
Herb, 2 m, rocky in A/C.B. in S.E. of Park, occasional
J. spicata Pax — G 18903; A & M 35
Herb, 2 m, *Acacia/Commiphora* bushland, occasional
**J. oblanceolata* A.R. Smith — SM 51 (type)
Shrub, 1.3 m, near Leopard Rock, occasional
Meineckia phyllanthoides Baill. L. ssp. *somalensis* (Pax) Webster — SM 127
Woody herb near Tana River, uncommon
**Monadenium* sp. — G 16994
Stem succulent, 40 cm, A/C.B. in S.E. of park, uncommon
Phyllanthus maderaspatensis L. — A 496
Herb, 1 m, swampy grassland near N. W. boundary, common
P. sepialis Muell. Arg. — A & M 63, 88
Shrub, 1 m, *Combretum* W.G., common near rivers
Ricinus communis L. — A 502
Shrub, 2 m, *Combretum* W.G., common near rivers

Securinega virosa (Willd.) Pax & K. Hoffm. — A & M 131, 254
Shrub, 2 m, *Combretum* wooded grassland, common
Synadenium glaucescens Pax — A & M 26
Somewhat succulent shrub, 4 m, near Rojewero R., occasional
Tragia insuavis Prain or related sp. — A & M 244
Bushy herb, 1 m, *Combretum* wooded grassland, occasional

146. Caesalpiniaceae (Leguminosae : Caesalpinioideae) F.T.E.A. (1967)

Bauhinia taitensis Taub. — G 18922; A & M 85, 140
Shrub, 1 m, *Combretum* W.G. and *Acacia/Commiphora* B., common
B. tomentosa L. — A & M 228
Shrub, 2 m, *Combretum* W. G. and *Acacia/Commiphora* B., common
Caesalpinia decapetala (Roth) Alston — A & M 121
Softly woody shrub, 1 m, *Combretum* W. G., common near W. boundary
C. volkensii Harms — A & M 392
Shrub, 2 m, *Combretum* W. G., occasional near water.
Cassia absus L. — G 17020
Annual herb, 40 cm, C.W.G. in west of park, frequent
C. fallacina Chiov. — A & M 320
Herb, 20-60 cm, *Combretum* wooded grassland & A.W.G., common
C. floribunda Cav. — A & M 104
Herb, 1 m, riverine near w. boundary, common
C. longiracemosa Vatke — SM 186
Bush 1-2 m tall, A.W.G., occasional
C. mimosoides L. — A & M 130, 299
Herb, 0.5 m, riverine, widespread
Delonix elata (L.) Gamble — A & M 229
Tree, 15 m, *Acacia/Commiphora* bushland, common
Piliostigma thonningii (Schumach.) Milne-Redh. — A & M 77, 399
Bush or small tree, 2 m, C.W.G., common at swamp margins
Tamarindus indica L. — A & M 24
Tree, 20 m, *Combretum* W.G. & A/C. bushland, riverine
**Tylosema humifusa* (Pic. Ser. & Rot. Mich.) Brenan forma — G 17011
Spreading herb from massive rootstock, A.W.G. & C.W.G., frequent

147. Mimosaceae (Leguminosae : Mimosoideae) F.T.E.A. (1959)

Acacia ataxacantha DC. — A & M 119, 155
Scandent shrub, *Acacia/Commiphora* bushland, common
A. brevispica Harms — A & M 420
Subscandent shrub, 4 m, *Acacia/Commiphora* bushland, common
A. bussei Sjoest. — EP
Small tree, 5 m, *Acacia/Commiphora* bushland, occasional
A. drepanolobium Sjoest. — s.r.
Small bushy tree, swamps patches in C.W.G., S. of Kiolu R., occasional
A. elatior Brenan ssp. *elatior* — A & M 23, 287; A 517
Tree, 20 m, banks of permanent rivers, common
A. hockii De Wild. — F & M 49925
Small tree or large shrub c. 4 m, A.W.G. in north of park, occasional
A. horrida (L.f.) Willd. ssp. *benadirensis* (Chiov.) Hillc. & Brenan — SM 116
Spreading shrub 1.5 m, tall in *Acacia/Commiphora* bushland, uncommon
A. mellifera (Vahl) Benth. — A & M 62, 175, 286
Shrub or tree, 10 m, ubiquitous, common
A. nilotica (L.) Del. ssp. *subalata* (Vatke) Brenan — A & M 45, 369, 424
Tree, 10 m, often umbrella shaped, C.W.G., common near W. boundary
A. reficiens Wawra ssp. *misera* (Vatke) Brenan — A & M 418
Spreading shrub, 2 m, *Acacia/Commiphora* B., common near Tana R.
A. robusta Burch. ssp. *usambarensis* (Taub.) Brenan — A & M 110; A 510
Tree, 20 m, riverine, especially near W. boundary of park
A. senegal (L.) Willd. var *senegal* — A & M 10, 198, 285
Shrub or tree, 10 m, ubiquitous, common
A. seyal Del. var. *fistula* (Schweinf.) Oliv. — A & M 339
Shrubby tree, 3 m, common on alkaline swampy soil
A. stuhlmannii Taub. — EP
Low spreading bush 1-2 m tall in east of park, occasional
A. tortilis (Forsk.) Hayne ssp. *spirocarpa* (A. Rich.) Brenan — SM 47, 102, 167
Umbrella-shaped tree 5-8 m tall near water courses in dry areas frequent
A. xanthophloea Benth. — SM 60, A 501
Tree, 20 m, flat-crowned, riverine near W. boundary

A. zanzibarica (S. Moore) Taub. var. *microphylla* Brenan — A 564
Shrubby tree, 3 m, A/C.B.-A.W.G. ecotone, occasional
Albizia amara (Roxb.) Boiv. ssp. *amara* — A 559
Tree, 10 m, *Acacia/Commiphora* bushland, occasional
A. anthelmintica Brongn. — A & M 120
Shrub or tree, 6 m, ubiquitous, common
A. harveyi Fourn. — A & M 371; A 525
Tree, 20 m, A/C.B.-C.W.G. ecotone, occasional
**A. tanganyicensis* Bak.f. ssp. *adamsoniorum* Brenan — TA 13; F 49954; A & M 157
Tree, 10 m, lower slopes of inselbergs and rocky places in A.C.B., occasional
Entada leptostachya Harms — A & M 370
Much branched liane, A/C.B.-C.W.G. ecotone, occasional
Newtonia hildebrandtii (Vatke) Torre — A & M 25; A 509, 527
Tree, 15 m, riverine, ubiquitous

148. **Papilionaceae** (**Leguminosae : Papilionoideae**; **Fabaceae**) F.T.E.A. (1971)

Abrus schimperi Bak. ssp. *africanus* (Vatke) Verdc. — A & M 166; G & A 20155
Shrub, 2 m, *Acacia/Commiphora* bushland, common
Aeschynomene schimperi A. Rich. — A & M 105, 284
Herb, 1 m, riverine, common
Alysicarpus glumaceus (Vahl) DC. var. *hispidicarpus* (Fiori) Lèon. — G. 18881
Herb, 40 cm, *Combretum* W.G. in S.W. of park, locally common
**Baphia keniensis* Brummitt — G & A 20173
Shrub, 3 m, groundwater forest in W. of park, uncommon
Clitoria ternatea L. — A & M 75
Climbing herb, riverine, common
Craibia brevicaudata (Vatke) Dunn ssp. *brevicaudata* — A & M 345
Tree, 5 m, A/C.B. near rivers, occasional
Crotalaria balbi Chiov. — A 487
Herb, 0.5 m, *Combretum* wooded grassland, occasional
C. emarginella Vatke — G 18887, 20142; A480
Herb, 0.5 m, *Combretum* wooded grassland, common
C. goodiiformis Vatke — A & M 208, 319
Herb, 1 m, *Combretum* wooded grassland, common
C. laburnifolia L. ssp. *laburnifolia* — A & M 354
Herb, 0.5 m, basement rock outcrops in C.W.G., uncommon
**C. oocarpa Bak.* ssp. *microcarpa* Milne-Redh. — M & F 623
Herb, 20 cm, A.W.G. near Leopard Rock, occasional
C. petitiana (A. Rich.) Walp. — A & M 96
Herb, 0.5 m, common at margin of swamps
C. uguenensis Taub. or related sp. — G 18893, 18926
Herb, 25 cm, C.W.G. & A/C.B., locally frequent
C. verdcourtii Polh. — G 18931; A & M 406
Herb, 1 m, *Combretum* wooded grassland, common
Dalbergia melanoxylon Guill. & Perr. — EP
Small tree, to 5 m, occasional
Glycine wightii (W. & A.) Verdc. var. *longicauda* (Schweinf.) Verdc. — A & M 102
Climbing herb, *Combretum* W.G., common near water
Indigofera arrecta A. Rich. — G. 16983
Herb, 1 m, *Acacia* wooded grassland, frequent
I. brachynema Gillett — G 18891, 20158
Annual herb, 20 cm, *Combretum* W.G. in west of park
I. colutea (Burm. f.) Merr. — A & M 199; G 20133
Herb, 25 cm, *Acacia/Commiphora* bushland, common
I. costata Guill. & Perr. ssp. *goniodes* (Bak.) Gillett — G 20175
Herb, 20 cm, *Acacia* W.G. in N.W. of park, occasional
I. hochstetteri Bak. — G 18880
Annual herb, 25 cm, *Combretum* W.G. in S.W. of park, occasional
I. schimperi Jaub. & Spach var. *baukeana* (Vatke) Gillett — A & M 298
Herb, 1 m, *Combretum* wooded grassland, common
I. schimperi Jaub. & Spach var. *schimperi* — A & M 303
Herb, *Combretum* W.G., common at swamp margins
I. volkensii Taub. — G 18878; A & M 185
Herb, 25 cm, C.W.G. and A/C.B., common
I. vicioides Jaub. & Spach var. *vicioides* — M & F 627
Herb, 20 cm, A.W.G. near Leopard Rock, occasional
Lonchocarpus bussei Harms — A & M 49
Tree, 10 m, *Combretum* wooded grassland, common

L. eriocalyx Harms	A & M 33
Tree, 12 m, *Acacia* wooded grassland, occasional	
Neorautanenia mitis (A. Rich.) Verdc.	A & M 249
Herb, 1.5 m, *Combretum* wooded grassland, common	
Ormocarpum keniense Gillett	A & M 191
Shrub, 2 m, A/C. bushland, occasional pure stands	
Rhynchosia minima (L.) D.C. var. *nuda* (D.C.) O. Ktze.	G 18892
Twining herb, 0.5 m, *Combretum* W.G. in W. of park, occasional	
**R*. sp. 'C' of F.T.E.A.	A & M 2
Climbing herb, occasional at swamp margins	
Sesbania quadrata Gillett	A & M 171, A 565
Herb, 1 m, *Combretum* W.G., common near temporary water	
S. sesban (L.) Merr.	R s.r.
Softly woody shrub at edge of stream, occasional	
Stylosanthes fruticosa (Retz.) Alst.	G s.r.
Herb, 30 cm, *Acacia/Commiphora* bushland, frequent	
Tephrosia noctiflora Bak.	G 17021, 18891; A & M 266
Herb, 1.5 m, *Combretum* wooded grassland, occasional	
T. polyphylla (Chiov.) Gillett	G 16980, 20124
Herb, 50 cm, A.W.G. and A/C.B., locally common in E. of park	
T. reptans Bak. forma	A 486
Herb, 1 m, *Combretum* W.G., common on disturbed land	
T. subtriflora Bak.	G 17012
Herb, 30 m, *Combretum* wooded grassland, occasional	
T. uniflora Pers.	G 16995; A & M 167, 302
Herb, 25 cm, C.W.G. and A/C.B., common on disturbed land	
T. villosa (L.) Pers. ssp. *ehrenbergiana* (Schweinf.) Brum.	G 17022
Herb, 0.5 m, C.W.G.—A/C.B. ecotone & A/C.B., common	
Vatovaea pseudolablab (Harms) Gillett	A & M 372
Woody twining herb, 0.5 m, C.W.G.—A/C.B. ecotone, frequent	
Vigna membranacea A. Rich. ssp. *caesia* (Chiov.) Verdc.	G 18930; A 569
Climber, *Acacia/Commiphora* bushland, common	
V. vexillata (L.) A. Rich.	V 3748; A 497
Climber, *Combretum* W.G., common near water	
**Zornia glochidiata* DC.	G 20134
Herb, 20 cm, shallow soil on rocky outcrops in A/C.B., locally common	

156. **Salicaceae**

**Populus ilicifolia* (Engl.) Rouleau	G 16991; A & M 288
Tree, 20 m, common on bank of Tana River	

167. **Moraceae**

Chlorophora excelsa (Welw.) Benth. & Hook. f.	G & A s.r.
Tree, 30 m, swamp forest on W. edge of park, occasional	
Ficus sycomorus L.	A & M 20
Tree, 15 m, riverine, ubiquitous	
F. sp.	A & M 422
Tree, 20 m, *Combretum* wooded grassland, occasional	

173. **Celastraceae**

Hippocratea sp.	A & M 211
Liane, groundwater forest on Rojewero, local	

180. **Salvadoraceae** F.T.E.A. (1968)

Dobera glabra (Forsk.) Poir.	O 75/1
Tree up to 6 m, A/C bushland, occasional	
Salvadora persica L.	A & M 416
Shrub, 3 m, bank of Tana River, common	

185. **Loranthaceae**

Erianthemum ulugurense (Engl.) Danser	A 537/A
Parasite on *Combretum aculeatum*, uncommon	
Phragmanthera dschallensis (Engl.) Balle forma vel. sp. aff.	A 524
Parasite on *Lonchocarpus eriocalyx*, uncommon	

190. **Rhamnaceae** F.T.E.A. (1972)

Berchemia discolor (Kl.) Hemsl.	SM 13, 59; A 563
Tree, 8 m, riverine in southern section, common	

Ziziphus abyssinica A. Rich. — EP
Small tree, 5-6 m, in A.W.G. and C.W.G., occasional
Z. pubescens Oliv. — EP
Tree to 15 m by streams in west of park, occasional

191. Vitaceae (Ampelidaceae)

**Cayratia gracilis* (Guill. & Perr.) Suesseng. — G & A 20165
Climber, Groundwater forest margin, occasional
Cissus quadrangularis L. — SM 42; A s.r.
Succulent climber rocky places, occasional
Cyphostemma sp. aff. *cyphopetalum* (Fres.) Wild & Drum. — G 20131
Climber, *Combretum* wooded grassland, occasional

194. Rutaceae

Clausena anisata (Willd.) Benth. — A & M 54
Shrub or small tree, 4 m, forest margin, common
Teclea simplicifolia (Engl.) Verdoorn — A 532
Shrub, 4 m, *Acacia/Commiphora* B., common, subdominant Rhino Alley
Vepris eugeniifolia (Engl.) Verdoorn? — A & M 163
Shrub, 4 m, *Acacia/Commiphora* bushland, common

195. Simaroubaceae

**Brucea* sp. perhaps new — G & A 20168
Shrub, 2 m, groundwater forest, occasional
Harrisonia abyssinica Oliv. — A & M 365
Shrub, 2 m, ubiquitous, common
**Kirkia tenuifolia* Engl. — G 17006
Small bushy tree, 5 m, A/C.B. in S.E. of park, occasional

195A. Balanitaceae

Balanites aegyptiaca (L.) Del. — A & M 92, 322
Tree, 10 m, *Acacia* wooded grassland, common
B. sp.
Scrambling shrub, *Acacia/Commiphora* bushland, occasional — A & M 30

196. Burseraceae

Boswellia hildebrandtii Engl. — G 18912; A & M 215
Shrub or small tree, 4 m, *Acacia/Commiphora* B., common
Commiphora africana (A. Rich.) Engl. — G 16987, 18908; A 558, 578.
Shrub or small tree, 4 m, *Acacia/Commiphora* B., common
C. boiviniana Engl. ssp. *boiviniana* — A & M 76, 341
Shrub or small tree, 4 m, occasionally liane-like, A/C.B. especially in less dry parts, common
C. campestris Engl. ssp. *heterophylla* (Engl.)— — A & M 31, 411
Small tree, 5 m, *Acacia/Commiphora* bushland, common
**C. engleri* Guillaumin or related sp. — G 18904
Shrub, 3 m, A/C.B. in S.E. of park, uncommon
C. flaviflora Engl. — EP
Shrub, 2-4 m, A/C. bushland in east of park, occasional
C. holtziana Engl. (perhaps = *C. erythraea* (Berg) Engl.) — G 16999; 20132; A & M 387
Shrub or tree, 8 m, *Acacia/Commiphora* bushland, frequent
C. madagascariensis Jacq. — A & M 347
Shrub or tree, 8 m, *Acacia/Commiphora* bushland, frequent
C. mollis (Oliv.) Engl. forma (*C. mildbraedii* Engl.) — G 16988; A & M 361
Tree, 8 m *Acacia/Commiphora* bushland among rocks, occasional
C. rostrata Engl. — G 17000; A 554
Shrub, 2 m, *Acacia/Commiphora* bushland in E. of park, occasional
C. samharensis Engl., or related sp. — G 17025; A & M 348
Shrub or small tree, *Acacia/Commiphora* bushland, occasional
C. schimperi (Berg) Engl. — G 20174
Shrub, 3-4 m, *Acacia* W.G. in west of Park, occasional
**C.* sp. undescribed? — A 445
Sprawling shrub, 1 m, A.W.G. near Murera river, uncommon

197. Meliaceae

Melia volkensii Guerke — A & M 39, 421
Tree, 15 m, outcrops of basement rock in A.W.G. & C.W.G., occasional
Trichilia roka (Forsk.) Chiov. — A & M 86, 425
Tree, 12 m, riverine, occasional near west boundary.

**Turraea parvifolia* Deflers Shrub, 2 m, *Acacia/Commiphora*—A.W.G. ecotone, occasional	A & M 27

198. **Sapindaceae**

Allophylus sp. Shrub, 3 m, at edge of groundwater forest, locally frequent	JA 2; M & F 656; G & A 20162
Blighia unijugata Bak. Tree, 30 m, groundwater forest on Rojewero, local	A & M 52; G & A 20169
Cardiospermum corindum L. Climber, *Acacia/Commiphora* bushland, uncommon	A & M 359
C. halicacabum L. Climber, *Acacia* W.G. and *Combretum* W.G., occasional	A & M 64; A 556
**Deinbollia borbonica* Scheff. Tree, 5 m, riverine, A/C.B.—C.W.G. ecotone, common	A & M 111
Lecaniodiscus fraxinifolius Bak. Tree, 20 m, riverine, occasional	A & M 305
Lepisanthes senegalensis (Poir.) Leenh. Sapling, 4 m, riverine, occasional near W. boundary	A & M 58

205. **Anacardiaceae**

Heeria reticulata (Bak.f.) Engl. Tree, 10 m, *Combretum* wooded grassland, occasional	A & M 403
Lannea stuhlmannii (Engl.) Engl. Tree, 10 m, *Combretum* wooded grassland, occasional	A & M 17, 396
L. triphylla (A. Rich.) Engl. Tree, 5 m, *Acacia* wooded grassland, uncommon	G 17023; A 551
Sclerocarya caffra Sond. Tree, 8 m, riverine, common near west boundary	A & M 69, 402

213. **Umbelliferae (Apiaceae)**

Pimpinella sp. aff. *etbaica* Schweinf. Herb, 0.4 m, common on disturbed land	A 429

DICOTYLEDONS: GAMOPETALAE

221. **Ebenaceae**

Diospyros abyssinica (Hiern) F. White Tree, 10 m, riverine and G.W.F. near west boundary	A & M 71
Diospyros mespiliformis A. DC. Tree, 20 m, groundwater forest on Rojewero river, local	A & M 56

222. **Sapotaceae** F.T.E.A. (1968)

Pachystela brevipes (Bak.) Engl. Tree, 20 m, groundwater forest in W. of park, occasional	G & A 20172

230. **Apocynaceae**

Adenium obesum (Forsk.) Roem. & Schult. Shrub or small tree with swollen stem, 6 m, A/C.B., uncommon	A 443
Hunteria zeylanica Thw. var. *africana* (K. Sch.) Pichon Tree, 7 m, bank of Ura River, occasional	G 18905; A & M 388
Pleiocarpa pycnantha (K. Sch.) Stapf Shrub, 2 m, groundwater forest on Rojewero, occasional	A & M 169
Rauvolfia caffra Sond. Tree, 10 m, riverine, common near west boundary	A & M 72
Tabernaemontana usambarensis K. Sch. Tree, 12 m, riverine, common near west boundary	A & M 44

231. **Asclepiadaceae**

Calotropis procera (Ait.) Ait.f. Woody herb, 2 m, widespread, occasional	A & M 13
Cynanchum defoliascens K. Sch. Slightly woody twiner, A/C.B. in south of the park, occasional	SM 132
Diplostigma canescens K. Sch. Softly woody twiner, A/C.B. in S.E. of park, occasional	G 18914
Dregea stelostigma (K. Sch.) Bullock Woody herb, 0.5 m, *Acacia* wooded grassland, occasional	G 18920; A & M 336
Kanahia laniflora (Forsk.) R. Br. Herb, 1 m, on rocks or gravel near rivers, common	G 16997; A & M 32

Oxystelma bornouense R. Br.	G 16998; PA 516
Twiner near river in A/C.B. in S.E. of park	
Pergularia daemia (Forsk.) Chiov.	M & F 661
Twiner, on stony hill in A/C.B. in east of park, occasional	
Stathmostelma pedunculatum (Dcne.) K. Sch.	A & M 205
Herb, 30 cm, *Combretum* W.G., common near W. boundary	

232. **Rubiaceae**

Adina microcephala (Del.) Hiern	A & M 22, 316
Tree, 25 m, riverine, occasional near W. boundary	
Carphalea glaucescens (Hiern) Verdc.	G 18896; A & M 383
Shrub, 2 m, *Acacia/Commiphora* bushland, occasional	
Conostomium quadrangulare (Rendle) Cuf.	A & M 196
Herb, 60 cm, *Acacia/Commiphora* bushland, common	
Hymenodictyon parvifolium Oliv.	A & M 135
Shrub, 3 m, *Acacia/Commiphora* bushland, occasional	
Kohautia caespitosa Schnizl. var. *amanienis* (K.Kr.) Brem.	A 571
Herb, 0.5 m, *Acacia/Commiphora* bushland, common roadside weed	
**Oldenlandia ichthyoderma* Cuf.	A & M 328
Herb, 25 cm, A/C.B.—A.W.G. ecotone, occasional	
Otomeria oculata S. Moore	A & M 276
Herb, 0.5 m, rocky inselbergs, uncommon	
Oxyanthus oxycarpus S. Moore	G & A 20167
Shrub, 2 m, groundwater forest on Rojewero, occasional	
Paederia pospischilii K. Sch.	A & M 380, 423
Climber, *Acacia/Commiphora* bushland, occasional	
Pavetta capillipes Brem.	JA 66/1
Shrub, 1-2 m tall, near river, uncommon	
Pentanisia ouranogyne S. Moore	A & M 184
Herb, 25 cm, A.W.G. & A/C.B., common	
Pentas parvifolia Hiern	A 530
Semi woody shrub, 2 m, C.W.G.—A/C.B. ecotone, common	
Psychotria riparia (K. Sch. & K. Kr.) Petit	G & A 20166
Shrub, 2 m, G.W.F. in W. of park, occasional	
**Tapiphyllum* sp.	A 522
Shrub, 2 m, *Acacia/Commiphora* bushland, occasional	
Tarenna graveolens (S. Moore) Brem.	SM 138
Shrub c. 1 m, tall on rocky slopes near Tana R., occasional	
Vangueria acutiloba Robyns	A & M 55
Tree, 6 m, groundwater forest on Rojewero, local	

238. **Compositae** (**Asteraceae**)

Aspilia mossambicensis (Oliv.) Wild	M & F 616; A 533
Herb, 1 m, margins of thickets in N.W. of park and near Leopard Rock, occasional	
Blepharispermum fruticosum Klatt & Schinz	SM 73
Shrub 1-1.5 m tall, occasional in N.E. part of park	
Conyza aegyptiaca Ait.	A & M 107
Herb, 40 cm, riverine, common in *Acacia* wooded grassland	
Helichrysum glumaceum DC.	A 544; G 20148
Herb, 50 cm, A.W.G. & A/C.B., common	
Launaea cornuta (Oliv. & Hiern) C. Jeffr.	A & M 50
Herb, 30 m, *Acacia* W.G. and *Combretum* W.G., occasional	
Sclerocarpus africanus Jacq.	SM 38
Alien weed near Leopard Rock Camp	
Sphaeranthus ukambensis O. Hoffm.	A & M 91
Herb, 25 cm, *Acacia* wooded grassland, common	
Tridax procumbens L.	A & M 289
Herb, 40 cm, common near Tana River	
Vernonia cinerascens Sch. Bip.	SM 4
Woody herb, c. 1 m tall, A.W.G., occasional	
V. colorata Drake	A & M 65
Softly woody shrub, 4 m, C.W.G., occasional near water	
V. pauciflora Less.	A & M 126
Herb, 1 m, *Combretum* wooded grassland, common	
V. sp. near *hindii* S. Moore	A & M 78
Herb, *Combretum* W.G., common near W. boundary	

248. **Campanulaceae**

Cyphia glandulifera Hochst Twining herb with tuberous root, *Combretum* W.G., occasional	A & M 311

249. **Boraginaceae**

Cordia africana Lam. Tree, 30 m, groundwater forest on Rojewero, local	A & M 53
C. ovalis DC. Shrub or small tree, 3 m, A/C.B., common near water	A & M 136
C. quarensis Guerke or related sp. Shrub, *Acacia/Commiphora* bushland, common	A & M 108
C. sinensis Lam. Shrub or small tree to 6 m, near water courses, common	SM 99
Heliotropium pectinatum Vaupel Herb, 50 cm, *Acacia* W.G. and *Combretum* W.G., common	SM 5; A & M 42, 134
H. steudneri Vatke Herb 50 cm tall in *Acacia* W. G., locally common	F & M 49928
H. strigosum Willd. Herb, 30 cm, *Combretum* wooded grassland, occasional	G & A 20157
H. subulatum (DC.) Martelli Herb, 25 cm, A.W.G.—A/C.B. ecotone, occasional	G 16981; A & M 410
Trichodesma zeylanicum (L.) R. Br. Herb, 1 m, A.W.G., occasional at swamp margins	A & M 98

250. **Solanaceae**

Solanum arundo Mattei Shrub, 3 m, A.W.G. in N.E. of park, occasional	SM 185
S. dasyphyllum Thonn. Herb, 1 m, *Combretum* W. G., common in shady places	A & M 307
S. dubium Fres. Herb, 50 cm, *Acacia* W.G. & A/C.B. ecotone, common	AM 160; M & F 36; A & M 414
S. incanum L. Herb, 1 m, *Combretum* W. G., common on disturbed land	A & M 124
S. renschii Vatke Woody herb, c. 1 m tall, A.W.G., occasional	SM 17
S. sp. Herb, 0.5 m, *Acacia/Commiphora* bushland, common	A & M 221

251. **Convolvulaceae** F.T.E.A. (1968)

Astripomoea hyoscyamoides (Vatke) Verdc. var *hyoscyamoides* Herb, 1 m, *Acacia/Commiphora* bushland, common	G & A 20154
A. lachnosperma (Choisy) Meeuse Herb, 40 cm, *Combretum* wooded grassland, common	G 17007, 20153; A & M 195
A. malvacea (Kl.) Meeuse var. *floccosa* (Vatke) Verdc. Herb, 60 cm, *Combretum* wooded grassland, occasional	A & M 352
Convolvulus rhyniospermus Choisy Herb, 25 cm, *Acacia* wooded grassland, uncommon	A 547
Evolvulus alsinoides (L.) L. Herb, 25 cm. *Combretum* wooded grassland, common	A & M 238
Hildebrandtia sepalosa Rendle Shrublet, 0.5-1 m, *Acacia/Commiphora* bushland, frequent	G 18910
Ipomoea arachnosperma Welw. Climbing herb, *Combretum* W.G., occasional near W. boundary	A 526
I. cicatricosa Bak. Shrub, 1-2 m, *Acacia/Commiphora* bushland, occasional	A & M 216
**I. coscinosperma* Choisy Creeping herb, common at swamp margins	A 473
**I. fulvicaulis* (Choisy) Hall. f. vel. aff. Annual, 50 cm, A.W.G. near Leopard Rock, occasional	M & F 629
I. mombassana Vatke Climbing herb, *Acacia* wooded grassland, common	A & M 90
I. obscura (L.) Ker Gawl Low, creeping herb, *Acacia/Commiphora* B., occasional	A 576
I. spathulata Hall.f. Climber, *Acacia/Commiphora* bushland, occasional	A & M 224
Merremia pinnata (Choisy) Hall.f. Annual herb, 40 cm, *Combretum* W.G. in S.W. of park, frequent	G 17015, 20137

**M.* sp.	A & M 132
Herb, *Combretum* wooded grassland, uncommon	
Seddera hirsuta Hall.f. var. *gracilis* (Chiov.) Verdc.	SM 112
Prostrate herb on poor soils in A.W.G., occasional	
S. latifolia Hochst. & Steud. var. *argentea* (Terrac.) Capua	G 18895
Woody herb, 20 cm, eroded slopes in A/C.B. in S.E. of park, locally frequent	

252. Scrophulariaceae

Craterostigma sp.	A & M 326
Herb, A/C.B.—A.W.G. ecotone, uncommon	
Ghikaea speciosa (Rendle) Diels	G 18923; A 543
Woody herb, 1 m, A.W.G. & A/C.B. locally, frequent near E. boundary	
Pseudosopubia hildebrandtii (Vatke) Engl.	G 17019
Herb, 50 cm, *Combretum* wooded grassland, occasional	
Stemodiopsis rivae Engl.	V 3743
Small herb on rocks, Mugwongo hill, occasional	

257. Bignoniaceae

Kigelia africana (Lam.) Benth.	A & M 15
Tree, 20 m, A.W.G. and C.W.G., common	
Markhamia hildebrandtii (Bak.) Sprague	A & M 46
Tree, 20 m, riverine, common near west boundary	

258. Pedaliaceae F.T.E.A. (1953)

Sesamothamnus busseanus Engl.	A & M 356, 39
Shrub or small tree, *Acacia/Commiphora* bushland, common	
Sesamum angustifolium (Oliv.) Engl.	A & M 197
Herb, 0.5 m, A/C.B.—A.W.G. ecotone, uncommon	
S. latifolium Gillett	A & M 204
Herb, 1 m, *Combretum* wooded grassland, uncommon	

259. Acanthaceae

Adhatoda englerana (Lindau) C.B. Cl.	G & A 20163
Shrub, 1 m, ground water forest margin, common locally	
Anisotes parvifolius Oliv.	SM 133
Shrub, 1-2 m, A/C. bushland near Tana R., occasional	
Asystasia charmian S. Moore	A & 398, 495
Herb, 25 cm, C.W.G., occasional near water	
A. somalensis (Franch.) Lebrun & Touss.	H.S. *s.n.*
Herb, 25 cm, locally frequent	
Barleria argentea Balf.f.	JA 5; G 17002; A & M 37
Herb, 25 cm, *Acacia* wooded grassland, occasional	
B. eranthemoides R. Br.	SM 12; A 459
Shrublet, 0.5 m, *Acacia/Commiphora* bushland, common	
B. submollis Lindau	G 17010; A 521
Woody herb, 0.5 m semiscandent, A/C.B. occasional	
Blepharis linariifolia Pers.	A & M 43
Herb, 15 cm, *Acacia* wooded grassland, occasional	
B. maderaspatensis (L.) Roth ssp. *rubiifolia* (Schumach.) Napper	A & M 200
Herb, 25 cm, *Acacia* W.G., common riverside weed	
Crabbea velutina S. Moore	A & M 344
Herb, 25 cm, *Acacia/Commiphora* bushland, occasional	
Duosperma kilimandscharicum (Lindau) Dayton	SM 143; A & M 160, 174
Scrambling shrub, C.W.G.—A/C.B. ecotone, riverine, common	
D. sp. 'A' of Upland Kenya Wild Flowers	V 3742; G 20143; A & M 36
Bushy herb, 1-1.5 m, A.W.G. & A/C.B., locally common	
Dyschoriste thunbergiiflora (S. Moore) Lindau	F & M 49932; A & M 213
Herb, 1 m, riverine in *Combretum* W.G., occasional	
D. sp.	G 18901
Prostrate herb, eroded slopes in A/C.B. in S.E. of park, locally common	
Justicia cordata (Nees) T. And.	A & M 34, 301
Herb, 60 cm, *Acacia* wooded grassland & C.W.G., common	
J. exigua S. Moore	A & M 386
Herb, 25 cm, A/C.B., common along Ura River	
J. fischeri Lindau	SM 134
Herb, 40 cm, A/C. bushland near Tana River	
J. flava Vahl	A & M 397
Herb, 25 cm, *Combretum* wooded grassland, frequent	

J. whytei S. Moore or related sp. Herb, 40 cm, *Acacia* wooded grasland, occasional	JA 4
J. sp. Herb, 40 cm, *Acacia/Commiphora* bushland and A.W.G., occasional	A & M 188; 252
Neuracanthus ukambensis C.B.Cl. Herb, up to 1 m, A/C. bushland, locally frequent	JA 70; HS *s.n.*
**Rhinacanthus pulcher* Milne-Redh. Herb, 1.5 m, *Acacia/Commiphora* bushland, occasional	PA 517
Ruellia sp. Herb, *Combretum* W.G., common on shaded river banks	A & M 308
Ruttya fruticosa Lindau Shrub, 2 m, *Acacia/Commiphora* bushland, uncommon	A 466
Thunbergia guerkeana Lindau Climber, unbiquitous, common	A & M 40

263. Verbenaceae

Chascanum hildebrandtii (Vatke) Gillett Herb, 0.5 m, C.W.G. & A/C.B., common	G 17017; A 573
Clerodendrum sp. near *myricoides* R. Br. Shrub, 1.5 m, A/C.B.—C.W.G. ecotone, common	A & M 262
Cyclocheilon eriantherum (Vatke) Engl. Shrub, A/C.B.—A.W.G. ecotone, occasional	G 18919; A & M 332
Lantana camara L. Shrub, A.W.G., occasional near buildings at Kenmere	A & M 282
L. viburnoides (Forsk.) Vahl Shrub, 1.25 m, *Acacia/Commiphora* bushland, common	A & M 384
Premna hildebrandtii Guerke Woody climber in riverine thicket near W. boundary, common	A & M 57
P. oligotricha Bak. Semi-scandent shrub, *Acacia/Commiphora* B., Common	A & M 343
P. resinosa Schauer Shrub, 2 m, *Acacia/Commiphora* B., occasional	G 18917
P. sp. Shrub, *Acacia/Commiphora* bushland, occasional	A & M 154

264. Labiatae (Lamiaceae)

Becium sp. Herb, 25 cm, *Acacia/Commiphora* bushland, common roadside weed	A & M 177
Endostemon gracilis (Benth.) Ashby Herb, 25 cm, *Combretum* W. G., common at swamp margins	A & M 229
E. tereticaulis (Poir.) Ashby Herb, 20 cm, *Acacia/Commiphora* B., locally frequent	G 20128
Geniosporum hildebrandtii (Vatke) Ashby Herb, 40 cm, *Combretum* wooded grassland, locally frequent	G 17018
Hoslundia opposita Vahl Woody herb, 1.25 m, *Combretum* wooded grassland, occasional	A & M 253
Leucas mollis Bak. Shrubby herb, 1.2 m, *Acacia* wooded grassland, frequent	HS *s.n.*; SM 26; G & A 20159
L. pratensis Vatke Slender straggling herb, occasional	SM 24
**L.* sp. aff. *L. mogadoxensis* Chiov. Herb, 40 cm, A.W.G.—A/C.B. ecotone, occasional	A & M 377
**L.* sp. Herb, 50 cm, *Combretum* wooded grassland, locally common	A & M 367
Ocimum hadiense Forsk. Herb, 50 cm, open spots in A/C.B. in S.E. of park, locally abundant	G 18921, 20127; R 1785, 1801
O. suave Willd. Herb, 1-1.5 m, *Acacia* wooded grassland, occasional	SM 68
Orthosiphon sp. Herb, 25 cm, common along N.E. boundary of park	A 540
Tinnea aethiopica Hook. f. Shrub, 1.5 m, *Acacia/Commiphora* bushland, occasional	A & M 349; A 546

MONOCOTYLEDONS

280. Commelinaceae

Aneilema johnstonii K. Sch. — A & M 227
Herb, 30 cm, *Combretum* W.G., occasional at swamp margins
A. petersii (Hassk.) C.B.Cl. — A & M 263
Herb, 30 cm, A/C.B.—C.W.G. ecotone, common
Anthericopsis sepalosa (C.B.Cl,) Engl. — A & M 117
Herb, 30 cm, *Combretum* W.G., A/C. bushland common
Commelina africana L. var. *milleri* Brenan — A & M 239
Herb, 20 cm, *Combretum* wooded grassland, occasional
C. albescens Hassk. — A & M 203
Herb, 15 cm, *Acacia/Commiphora* bushland, occasional
C. benghalensis L. — A & M 202
Herb, 30 m, *Acacia/Commiphora* bushland, common
C. forskalaei Vahl — G 18882; A & M 147
Herb, 25 cm, *Acacia/Commiphora* bushland, common in rocky places
C. sp. 'C' of Upland Kenya Wild Flowers — A & M 210
Herb, 30 cm, ground water forest on Rojewero, locally common
Cyanotis sp. — G s.r.
Succulent herb, 15 cm, rocky places, frequent

293. Liliaceae

Albuca wakefieldii Bak. — R 2120
Bulbous herb, *Combretum* wooded grassland, occasional
Anthericum cooperi Bak. — A & M 331, 394
Herb, 20 cm, *Acacia* wooded grassland and C.W.G., common
Asparagus racemosus Willd. — A & M 47A
Climber, common in dense bush near W. park boundary
A. setaceus (Kunth) Jessop — A & M 47B
Climber, common in dense bush near W. park boundary
Chlorophytum gallabatense Bak. — A & M 165
Herb, 25 cm, A/C.B.—*Combretum* W.G. ecotone, common
C. tenuifolium Bak. — A & M 209
Herb, 25 cm, A/C.B. ecotone—*Combretum* W.G., common
C. tuberosum (Roxb.) Bak. — A & M 127
Herb, 0.5 m, *Combretum* W.G., common in damp places
**C.* sp. undescribed (=Gillett 12819) — A & M 251
Herb, 25 cm, common in swampy grasslands
**Drimiopsis volkensii* (Engl.) Bak. — JA 65
Bulbous plant, uncommon
Eriospermum triphyllum Bak. — A & M 168, 260
Herb, A/C.B.—C.W.G. ecotone, common
Gloriosa minor Rendle — A & M 408
Herb, 30 cm, *Acacia* W.G. and *Combretum* W.G., occasional
G. superba L. — R 2119
Erect or climbing herb to 1 m, *Combretum* W. G., occasional
Ornithogalum donaldsonii (Rendle) Greenway — G 18928
Bulbous herb, 30 cm, A/C.B., common locally in S.E. of park
Scilla kirkii Bak. — A & M 250
Bulbous herb, 20 cm, common in swampy grassland near W. boundary

302. Araceae

Stylocheiton sp. (broad leaves) — G & A 20160/B
Herb, 30 cm, N.W. side of park, occasional in evergreen bushland
S. sp. (narrow leaves) — G s.r.
Herb, 25 cm, A/C.B. in S.E. part of park, locally common

306. Amaryllidaceae

Crinum kirkii Bak. — A & M 193
Bulbous herb, near W. boundary of park, occasional
**Pancratium trianthum* Herb. — A & M 173
Bulbous herb, *Combretum* W.G. & *Acacia* W.G., locally common

313. Agavaceae

Sansevieria ? intermedia N.E.Br. — R 2107
Leaves subcylindric, on red sandy soil in A/C.B.
S. ? raffillii N.E.Br. — R 2118
Leaves flat, in *Acacia* wooded grassland

314. Palmae (Arecaceae)

Hyphaene coriacea Gaertn. — S s.r.
Tree, 12 m, common in swamps and on river banks

Phoenix reclinata Jacq. — A & M 87
Tree, 5 m, riverine, common

Raphia farinifera (Gaertn.) Hyland. — A s.r.
Riverine, common, particularly near W. boundary

318. Hypoxidaceae

Hypoxis angustifolia Lam. — A & M 248
Herb, 20 cm, *Combretum* wooded grassland, common

319. Velloziaceae

Xerophyta spekei Bak. — A & M 272
Woody herb, 1 m, summit of Mughwango, dominant locally

331. Cyperaceae

Bulbostylis sp. — A & M 145, 273
Rocky outcrops, common in wet season

Cyperus alternifolius L. ssp. *flabelliformis* (Rottb.) Kukenth. — A & M 4
Common in swamps and at river sides

C. articulatus L. — G 20119; A 457
Riversides, common

C. dives Del. — A & M 407
Riversides, common, particularly near N.W. park boundary

C. giolii Chiov. — A & M 255
Swamp margins in *Combretum* W.G., common

C. laevigatus L. — A & M 7
Swamps, common

C. obtusiflorus Vahl — A & M 118
Riversides, common

C. undulatus Kukenth. — A & M 3
1.5 m, growing densely towards centre of swamps, common

C. sp. near *kilimandscharicus* Kukenth. — A 481
Widespread, common in damp places

C. spp. — A & M 18, 219
Widespread, swamps rivers, occasional

Fimbristylis complanata (Retz.) Link — A & M 66
Riversides in *Combretum* wooded grassland, common

F. sp. — A & M 12
Swamp margins, common

Fuirena pubescens Kunth — A & M 5
Swamps, common

Kyllinga chrysantha K. Sch. — A & M 325
Acacia/Commiphora bushland, common in damp places

K. comosipes (Matf. & Kukenth.) Hepper — A & M 181
Acacia/Commiphora bushland, seasonally common in rocky places

K. flava C.B.Cl. — A & M 259
Common on river banks near W. park boundary

Mariscus pseudovestitus C.B.Cl. — A & M 280
Acacia/Commiphora bushland, occasional in rocky places

M. sp. = Napper 1617 — A & M 269
Summit of Mughwango, local

**Pycreus unioloides* (R. Br.) Urb. — A & M 11
Swamp margins, uncommon, first record for Kenya

Scirpus jacobii Fisch. — G 20151
By pool in rocky river bed, locally common

S. sp. aff. *jacobii* — G 20150
By pool in rocky river bed, locally common

332. Gramineae (Poaceae)

Acrachne racemosa (Roem. & Schult.) Ohwi — R 1799; A 458
1 m, *Acacia/Commiphora* bushland, occasional

Aristida adscensionis L. — A & M 265; R 1798
Ubiquitous, common

Bothriochloa glabra (Roxb.) A. Camus — A & M 242
Combretum wooded grassland, scattered dense clumps

Brachiaria brizantha (A. Rich.) Steud. *Acacia* wooded grassland, common near water	A 503
B. deflexa (Schumach.) Robyns *Acacia* wooded grassland, occasional, particularly on limestone	A 435
B. cruciformis (Sm.) Griseb. Low, isolated clumps, *Combretum* wooded grassland, near water	A 482
B. leersioides (Hochst.) Stapf A/C.B.—C.W.G. ecotone, common among rocks	A & M 266
B. serrifolia (Hochst.) Stapf Beneath *Acacia* by river in A/C.B., locally frequent	G 20139
Cenchrus ciliaris L. Ubiquitous, occasional clumps	A & M 84, 223, 368
Chloris gayana Kunth Dominant over most swamps and river valleys	A & M 232, 234
C. roxburghiana Schult. Ubiquitous, common in scattered clumps	A & M 100; A 438
C. virgata Sw. Widespread, occasional clumps	A 515
Chrysopogon plumulosa Hochst. Dominant over much of the *Acacia* wooded grassland	A & M 324; A 442
Cymbopogon excavatus (Hoschst.) Stapf Tall, c. 2 m, occasional clumps along N.W. park boundary	A & M 83; A 491
C. pospischilii (K. Sch.) C.E. Hubb. Tall. 1.5 m, *Acacia* wooded grassland, occasional	A 440
Dactyloctenium scindicum Boiss. Widespread, occasional	A & M 330
Dichanthium annulatum (Forsk.) Stapf Swamp margins, occasional	A & M 1
D. papillosum (A. Rich.) Stapf 1.5 m., widespread, common near water	A & M 373; A 470
Digitaria milanjiana (Rendle) Stapf 1 m, *Combretum* wooded grassland, occasional	A 507
D. pennata (Hochst.) T. Cooke	R 1803
D. velutina (Forsk.) Beauv. *Acacia/Commiphora* bushland, occasional	A & M 358
Dignathia hirtella Stapf *Acacia* wooded grassland, occasional	A 439
Dinebra retroflexa (Vahl) Panz. 30 cm, A/C.B.—A.W.G. ecotone, common	A 468
Echinochloa haploclada (Stapf) Stapf Widespread, common in damp places	A & M 233
E. sp. Common at swamp margins	A & M 230
Enteropogon macrostachys (A. Rich.) Benth. Widespread, common in damp places	A & M 357; A 454
Eragrostis caespitosa Chiov. *Combretum* wooded grassland, common on Ntoe Ndogo	A & M 353
E. cilianensis (All.) Lut. *Acacia* wooded grassland, particularly on limestone, common	A 432
E. ciliaris (L.) R. Br. *Acacia/Commiphora* bushland, scattered among weeds	A 572
E. cylindriflora Hochst. Widespread, occasional	A & M 363; A 431
E. maculenta (A. Rich.) Steud. Common in shade of riverine thicket near W. boundary	A 488
E. superba Peyr. Ubiquitous, common especially in seasonally damp places	A & M 240, 24
Eremopogon foveolatus (Del.) Stapf 1 m, ubiquitous in isolated clumps	R 1800; A 436
Eriochloa procera (Retz.) C.E. Hubb. Riversides, occasional	A 461
E. sp. 0.5 m, common on disturbed ground near W. boundary	A 494
Heteropogon contortus (L.) Roem. & Schult. Ubiquitous, occasional extensive pure stands	A & M 256
Hyparrhenia anamesa Clayt. Common in swamps along N.W. park boundary	A & M 82

H. filipendula (Hochst.) Stapf var. *pilosa* (Hack.) Stapf Tall, 2 m, common bordering swamps along N.W. boundary	A 490
H. rufa (Nees) Stapf Occasional clumps along west boundary	A 512
Leptochloa chinensis (L.) Nees Margin of rainwater pool in rocky river bed, locally frequent	G 20152
Leptothrium senegalensis (Kunth) Clayt. 25 cm, *Acacia/Commiphora* bushland, frequent	SM 174; R 1788; G 18900
Lintonia nutans Stapf *Combretum* W.G. and A/C. ecotone, occasional	A & M 374
Loudetia arundinacea (A. Rich.) Steud. Summit of Mughwango, local	A & M 270
Microchloa kunthii Desv. Summit of Mughwango, local	A & M 275
Panicum coloratum L. Ubiquitous in damp shady places	A & M 323
P. deustum Thunb. *Acacia/Commiphora* bushland, occasional	A & M 161; A 453
P. maximum Jacq. Widespread, common in damp shady places	A & M 257, 375
Pennisetum typhoides (Burm.) Stapf & C.E. Hubb. Occasional on disturbed ground	A 476
P. sp. Clumps to 1 m, common near N.W. park boundary	A 499
Rhynchelytrum repens (Willd.) C.E. Hubb. Widespread	A & M 267
R. villosum (Parl.) Chiov. Widespread, occasional	A 460
Rottboellia exaltata L.f. Widespread, common in damp places	A 437
Schmidtia pappophoroides J. A. Schmidt Summit of Ntoe Ndogo, abundant, isolated	A & M 351
Schoenefeldia transiens (Pilg.) Chiov. Widespread, occasional	A 467
Sehima nervosum (Willd.) Stapf Dominant over much of C.W.G., common in A.W.G.	A & M 351; A 430
Setaria aurea A. Br. *Acacia* wooded grassland, near N.W. boundary, occasional	A 493
S. holstii Herrm. *Combretum* wooded grassland, common at swamp margins	A & M 231, 376
S. incrassata (Hochst.) Hack. Occasional, clumps to 1 m, A/C.B.—*Acacia* W.G. ecotone	A 450
S. pallidifusca (Schumach.) Stapf & Hubb. *Acacia* W.G. and *Combretum* W.G., common, not abundant	A 426, 500
Sorghum versicolor Anderss. Ubiquitous, dominant in patches near N.E. boundary	A 425
S. verticilliflorum (Steud.) Stapf Tall, 2 m, *Combretum* W. G., occasional near W. boundary	A & M 103; A 489
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Summit of Mughwango, local
Urochloa mossambicensis (Hochst.) Stapf — A & M 222
Combretum wooded grassland, common

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NOTES ON SOME EAST AFRICAN APHIDS (HOMOPTERA, APHIDOIDEA)

By

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Twenty aphid species are recorded from Kenya and Tanzania. *Eonaphis crotonis* Quednau is new to East Africa; *Aphis fabae* subsp. *solanella* Theob. and *Macrosiphum rosae* L. are new to Tanzania. New host-plant records are added to some of the species. The male of *Neophyllaphis grobleri* Eastop is described for the first time and measurements of other morphs of this species and of the little known *Eonaphis crotonis*, previously found only once, are given.

INTRODUCTION

The aphid fauna of East Africa is treated in a monograph by Eastop (1958). Including some subsequent additions by Eastop (1959, 1961, 1966) the number of species previously known from Kenya and Tanzania amounts to 94, of which 81 species have been recorded from Kenya and 42 species from Tanzania.

The writer collected 20 aphid species in East Africa during an excursion with the Danish Natural History Society from December 26, 1971 to January 15, 1972. Eight species were found in southern Kenya and thirteen species in the north-eastern part of Tanzania.

The species are listed alphabetically below. Three of them are new to Tanzania and one of these is also new to East Africa. New host-plant records are added to some of the aphids previously known from Kenya and Tanzania.

Most of the plants on which the aphids were found were collected. They were subsequently delivered to the East African Herbarium, Nairobi, and identified by J. B. Gillett (indicated by an asterisk (*) in brackets behind the name of the plant). A few plants were identified in the field by the writer or by other members of the excursion. The aphids were identified by the writer.

LIST OF SPECIES

Aloephagus myersi Essig, 1950
Kariandusi Site, north of Naivasha, Kenya, Dec. 30; on *Aloë* sp. (Liliaceae).

Aphis craccivora Koch, 1854
Tsavo National Park East, Kenya, Jan. 1; on *Platycelyphium voense* (Engl.) Wild (*) (Papilionaceae), large colonies; also on *Alternanthera pungens* H. B. & K. (*) (Amaranthaceae) at the same locality, infested by large numbers though not a host; the aphids arrived from *Platycelyphium* a few metres away.

Aphis fabae Scopoli, 1763, subsp. *solanella* Theobald, 1913
West Kilimanjaro Forest Station (about 1500 m), Tanzania, Jan. 11; on *Solanum nigrum*

L. var. 'A' (*) (Solanaceae), large colonies crumpling the leaves; on *Malva verticillata* L. (*) (Malvaceae), only alatae; on *Capsella bursa-pastoris* (L.) Med. (Cruciferae), colonies on somewhat crumpled leaves.

Momella, Tanzania, Jan. 9-11; on *Bidens pilosa* L (*) (Compositae), colonies; on *Nicotiana glauca* R. Grah. (*) (Solanaceae), alatae in the inflorescences; on *Chenopodium opulifolium* Koch & Ziz (*) (Chenopodiaceae), large colonies on upper parts of stems; on *Agapanthus* sp. (cultivated) (Alliaceae), colonies on flowers and fruits; on *Vernonia pauciflora* Less. (*) (Compositae), one dead alata.

Mt. Meru, Tanzania, Jan. 12; on *Clutia* sp. (Euphorbiaceae), colonies on undersides of young leaves.

These seem to be the first records from Tanzania. The subspecies occurs in Africa and Europe, originally described by Theobald from Kenya. Eastop (1958: 72) recorded it from Njoro and Muguga in Kenya.

Aphis frangulae Kaltenbach, 1855, subsp. *gossypii* Glover, 1877

Momella, Tanzania, Jan. 10; on *Ageratum conyzoides* L. (*) (Compositae), apterae and nymphs.

Aphis nerii B. de Fonscolombe, 1841

Near Buiko between Tanga and Same, Tanzania, Jan. 9; on *Calotropis* sp. (Asclepiadaceae), colonies in inflorescences and in concavities on undersides of leaves (like *Cryptomyzus ribis* (L.) on *Ribes rubrum*), visited by ants.

Eonaphis crotonis Quednau, 1962

Arusha National Park, Tanzania, Jan. 10; on *Croton macrostachyus* A. Rich. (*) (Euphorbiaceae), large colonies consisting of apterous and alate viviparous females and immature specimens on undersides of leaves together with some ants. *Croton macrostachyus* was examined at several places, but the aphids were found on only one plant, near Momella Lakes.

This interesting species, which belongs in Setaphidinae, has previously been found only once, viz. in Wonderboom Nature Reserve, South Africa, Dec. 1960—Jan. 1961 on *Croton subgratissimus*, by Quednau, who described it (1962).

Also in South Africa the aphids were found on only one tree, although *Croton subgratissimus* occurred abundantly in the area.

The specimens from Tanzania are somewhat bigger than those described from South Africa, with longer antennal segment III and total antennal length, so some measurements (in mm) are given below:

Apterous viviparous females: body length 1.46-1.88, ant. 1.56-1.68, ant. segm. III 0.57-0.66. One specimen: body 1.73, ant. 1.60, ant. segm. III 0.64, IV 0.31, Va 0.21, Vb 0.30, siph. 0.13, ultimate rostral segm. 0.15, 2nd segm. of hind tarsus 0.11.

Alate viviparous females: body 1.63-1.66, ant. 1.60-1.83, ant. segm. III 0.64-0.72 with 18-24 secondary rhinaria. One specimen: body 1.66, ant. 1.70, ant. segm. III 0.72, IV 0.32, Va 0.21, Vb 0.31, siph. 0.13, ultimate rostral segm. 0.16, 2nd segm. of hind tarsus 0.11.

In Quednau's material the antennae are about 0.8 × body length in alatae, in the present material of the same length as the body or a little longer.

Hyperomyzus lactucae (L., 1758)

Thomson's Falls (2361 m), Kenya, Dec. 28; on *Sonchus oleraceus* L. (*) (Compositae).

Lake Naivasha (1893 m), Kenya, Dec. 29; on *Sonchus oleraceus* L. (*).

The species is almost cosmopolitan, according to Eastop (1966) occurring in Kenya highlands at altitudes of 1800-2700 m, whereas the related *H. carduellinus* (Theobald) in Kenya is found only up to about 2100 m.

The present material is identified with *H. lactucae* by means of the key in Eastop (1966). The altitudes of both above mentioned localities are more than 1800 m.

Macrosiphum rosae (L., 1758)

Arusha, Tanzania, Jan. 13; on *Rosa* sp., cultivated in gardens, pink apterae and nymphs.

This almost cosmopolitan species, the common pest to roses in Europe, has been recorded from several localities in Africa, in Eritrea, Kenya, Rhodesia, Uganda, South Africa (Eastop 1958: 47), Mozambique (Ilharco 1970), and Angola (van Harten & Ilharco 1971). This is the first record from Tanzania.

Macrosiphum (*Sitobion*) *africanum* Hille Ris Lambers, 1954

Western slope of Kilimanjaro (about 1800 m), Tanzania, Jan. 11; one alata swept from low vegetation on roadside in rain forest.

Macrosiphum (*Sitobion*) sp.

Mt. Meru, Tanzania, Jan. 12; on a woody member of the Hypericaceae, apterae killed by fungus disease.

It is perhaps *M.* (*S.*) *nigrinectaria* Theobald, 1915, but identification is not possible because the hind tarsi are missing.

Myzus ornatus Laing, 1932

Lake Naivasha, Kenya, Dec. 29; on cultivated variety of *Achillea millefolium* L. (Compositae) in gardens, large numbers of apterae and nymphs together with ants.

Ngurdoto Crater, Arusha National Park, Tanzania, Jan. 10; on *Sphaeranthus suaveolens* (Forssk.) D.C. (*) (Compositae), only two alatae.

Myzus (*Nectarosiphon*) *persicae* (Sulzer, 1776)

Near Ngobit north of Nyeri, Kenya, Dec. 28; one aptera swept from vegetation with *Bidens pilosa* L. (*) (Compositae).

Neophyllaphis grobleri Eastop, 1955

Near Amani, Usambara Mountains, Tanzania, Jan. 8; on *Podocarpus usambarensis* (according to label on the tree in the forest of the Malaria Station) (Podocarpaceae), large colonies on fullgrown tree, apterous and alate viviparous females and sexuales.

The host record is new. Previously this aphid has been found on *Podocarpus gracilior* (Eastop 1955), *P. milanjianus* (Eastop 1958), *P. henkelii* (Quednau 1962), and *P. engelmannii* (according to label on sample from West Africa collected by Eastop). It is known only from Africa south of Sahara (Kenya, Tanzania, South Africa, Cameroons) and is the only *Neophyllaphis* species occurring in Africa. The sample was identified by means of the key in Hille Ris Lambers (1967), and the oviparous females were compared with material from British Museum.

As the specimens from *P. usambarensis* are a little bigger than the specimens described by Eastop (1955) some measurements (in mm) are given below:

Apterous viviparous female: body 2.27, ant. 1.22, ant. segm. III 0.50, IV 0.21, V 0.20, VIa 0.13, VIb 0.04, ultimate rostral segm. 0.07, 2nd segm. of hind tarsus 0.16.

Alate viviparous females: body 2.11-2.84; number of rhinaria on ant. segm. III 92-104. Most specimens are ovipariform with hind tibiae bearing up to five pseudosensoria. One specimen: body 2.43, ant. 2.04, ant. segm. III 0.93, IV 0.39, V 0.32, VIa 0.16, VIb 0.04, ultimate rostral segm. 0.09, 2nd segm. of hind tarsus 0.17, hind tibia with one pseudosensorium.

Alate oviparous female: body 2.37, ant. 2.05, ant. segm. III 0.94, with 96-97 secondary rhinaria, IV 0.39, V 0.33, VIa 0.16, VIb 0.04, ultimate rostral segm. 0.08, 2nd segm. of hind tarsus 0.17, hind tibia with 35-36 pseudosensoria.

Alate male: has not been described previously. It is similar to the alate viviparous female, except that the third antennal segment bears about 140-150 secondary rhinaria, which in the basal half of the segment are of a shape similar to that in the alate female, viz. narrow, transversal, and linear and not ciliated, but not extending around the segment for more than a half of its circumference; in the middle part of about the same shape, but ciliated; and in the distal one third to two fifths transverse-oval or subcircular, ciliated and situated not only on one side of the segment, and the fourth segment with about 35 transverse-oval, ciliated rhinaria on all sides of the segment (the rest of the antenna is missing). Measurements of one specimen: body 2.13, ant. segm. III 0.84, IV 0.39, ultimate rostral segm. 0.07, 2nd segm. of hind tarsus 0.16.

In the viviparous females ant. segm. III is longer than in the material described by Eastop, and there are more secondary rhinaria in the alate viviparous females (92-104 against 54-76). Material from West Africa bridges the gap, however. In one sample collected by Eastop in Cameroons an alate viviparous female similar to Eastop's type material, with body length 2.60 mm and ant. segm. III 0.77 mm with 64 rhinaria, occurs together with an alate oviparous female similar to my material from the Usambara Mts., with body length 2.90 mm and ant. segm. III 0.97 mm with 81-82 rhinaria, so the differences should probably be ascribed to intraspecific variation only.

Rhopalosiphum rufiabdominalis (Sasaki, 1899)

Western slope of Kilimanjaro (about 1800 m), Tanzania, Jan. 11; one alata swept from low vegetation on roadside in rain forest.

Saltusaphis scirpus Theobald, 1915

Lake Naivasha, Kenya, Dec. 29; on *Pennisetum clandestinum* Chiov. (*) (Gramineae), apterous and alate viviparous females and immature specimens caught by shaking high grass in one place and low short-leaved grass of the same species in another place several metres away.

Though the aphids belong in two samples from the same plant species it is doubtful that *Pennisetum* is a true host because, elsewhere, this well-known aphid has been found feeding on Cyperaceae only. It is recorded from Egypt, Sudan, Kenya, South Africa, Mozambique, and Angola.

Schoutedenia bougainvilleae (Theobald, 1920)

Diani Beach south of Mombasa, Kenya, Jan. 3; on *Phyllanthus* sp. (*) (Euphorbiaceae), small colonies visited by ants, apterae and nymphs, from some of which alatae were reared.

Tetraneura nigriabdominalis (Sasaki, 1899)

Lake Naivasha, Kenya, Dec. 29; on *Pennisetum clandestinum* Chiov. (*) (Gramineae), alatae taken by shaking the plants over a board.

Toxoptera aurantii (B. de Fonscolombe, 1841)

Mt. Meru, Tanzania, Jan. 12; on *Rhamnus prinoides* L'Hér. (*) (Rhamnaceae), apterae and nymphs on undersides of leaves.

It is previously known from *Rhamnus*, though not *Rh. prinoides*.

Toxoptera citricidus (Kirkaldy, 1907)

Mt. Meru, Tanzania, Jan. 12; on *Clutia* sp. (Euphorbiaceae), one alata visited by ant.

Uroleucon (*Uromelan*) *Compositae* (Theobald, 1915)

Momella, Arusha National Park, Tanzania, Jan. 9-11; on several Compositae, large colonies on *Vernonia lasiopus* O. Hoffm. (*), *V. pauciflora* Less. (*), and *Conyza floribunda* H. B. & K. (*): a few specimens (alatae, apterae, nymphs) on *Gnaphalium undulatum* L. (*), some of them dead or dying, in one little colony together with a coccid-like ladybird larva: and finally single specimens on *Ageratum conyzoides* L. (*) (aptera), *Bidens pilosa* L. (*) (aptera), and *Galinsoga parviflora* Cav. (*) (alata).

Roadside between Momella and Arusha, Tanzania, Jan. 13; on *Vernonia glabra* (Steetz) Vatke (*) (alatae, apterae, nymphs).

The material all belongs to *U. compositae* subsp. *compositae*, also the sample from *Vernonia glabra*, the only host of *U. compositae* subsp. *evansi* Eastop, which lives in southern Tanzania and Rhodesia.

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